

OCTOBER 1949

35 CENTS

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POPULAR MECHANICS

MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

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ICE SCOOT—Build It for Winter Fun
--Page 190



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Low-priced car "A" has	13	
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**"That hammer?
You're kidding!"**



It's a fact, Bill. I've been using this same hammer for 29 years. It helped to build the house you were born in.

Well, I don't know how you do it. I hardly ever *use* a hammer, and yet I've broken two of them in the last year or so.

That so? What kind of hammers were they? What brand, I mean.

Gosh, I don't know. Guess they didn't *have* any brand names. But they were good bargains.

That's where the trouble is, Bill. Look . . . see the name on this hammer? Whenever you see that brand name, you

know it's a good hammer. Stick to the well-known, advertised brands when you buy tools, and in the long run you'll save a lot of money.

That makes sense, Fred. I'll remember it.

And do your buying at the hardware store, where they don't try to sell you anything but quality tools. That way you'll always get your money's worth.



POPULAR MECHANICS

Popular Mechanics Magazine

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H. H. WINDSOR, JR., Editor and Publisher



this month's cover

BRUCE BOMBERGER'S cover painting of the iceboat "Scoot" is his proof that a Californian (native of San Francisco) knows a thing or two about iceboating. Although Bomberger does some work in Chicago he has yet to live through a rugged Illinois winter. The frigid scene he has painted on the cover was imagined by the artist in his Chicago studio on a sultry summer day when he began work on the picture. He used photographs and scale drawings to make his preliminary sketches of the iceboat. Bill Harless, the racing champ who designed and built the original boat, was satisfied that Bomberger's Scoot was cutting across the canvas in the proper manner before the final go-ahead was given on the cover. Men on the staff, including Wayne Leckey and Clyde Lamme who worked on layout and text, have become iceboat enthusiasts. Warning: if you read the how-to-build-it article on page 190, you, too, may be buying planking

Volume 92

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Number 4

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SPACE FOR LIVING AND FAMILY GROWTH

This beautiful, modern home, with breezeway and garage, as pictured above, was built from these same plans and instructions by Jacques Brownson, a 23-year-old veteran in Aurora, Illinois. It is 1½ stories with basement, recreation room, living room, kitchen, dining nook, two bedrooms, bath, plenty of closets and space for 2 additional bedrooms on the second floor. An inspection of floor plans, shown in reduced size, indicates an unusually large amount of good, usable living space that can easily be increased to meet the needs of a growing family. The house itself is 35'-9" x 28'-11"; breezeway 20'-10" x 8'; garage 20'-10" x 12'.

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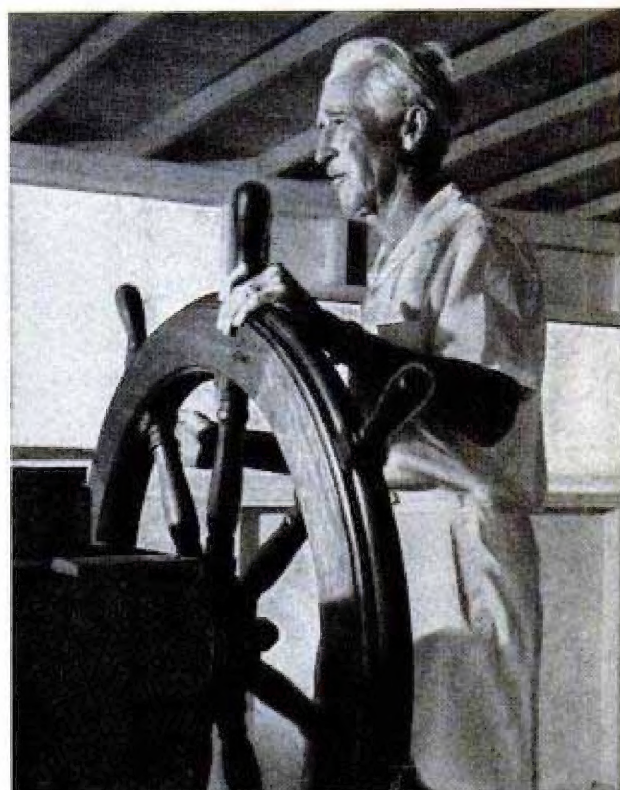
in this corner.....

THE EDITORS



Gar Wood

All the time Gar Wood was racing his Miss Americas to international fame (he holds the coveted Harmsworth Trophy and has defended and won it nine times since 1920) it seems he was dreaming of building a prototype for an ocean liner that will not roll or pitch. He is shown below on this craft, the Venturi, which is featured in story, pictures and diagrams beginning on page 120. This story broke right on the deadline for our October issue and getting



it into the magazine necessitated a speed play that even Gar Wood would applaud. We wired our eastern editor, Richard Dempewolff, in New York, to grab a plane for Miami, Fla., to get the story and pictures from Mr. Wood who was at his home on Fisher's Island near Miami Beach. Dempewolff left New York on a Tuesday morning and 24 hours later the complete story and pictures were in our Chicago office with much credit due to the fine cooperation of Eastern Air Lines. Many of the diagrams and photos in the layout, particularly those of Mr. Wood and the hull models, are exclusive. The photographs on page 122 clearly show the basic Venturi principle which assures a smooth ride.

(Continued to page 8)

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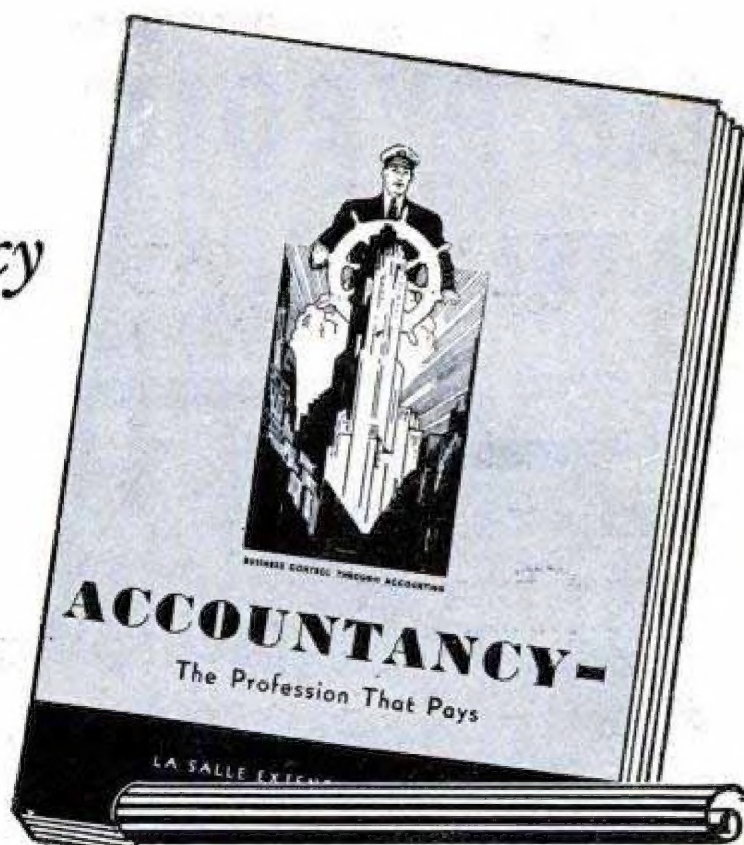
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(Continued from page 6)

World's Deepest Diver

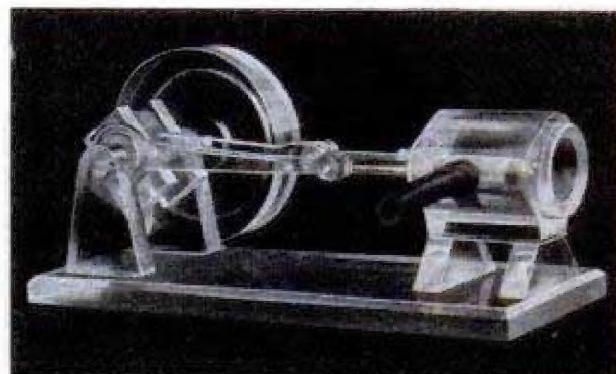
Man's quest into the mysteries of Nature carried Dr. Otis Barton 4500 feet beneath the sea to set a new diving record. At 4100 feet the lights in his benthoscope went out and he courageously gave the signal to drop 400 feet farther just to "see what I can without lights." Doctor Barton is shown below (foreground) as he shook hands with Dr. Maurice Nelles, an associate, immediately after he had emerged from the benthoscope on completion of the dive off Santa Cruz Island, Calif. The story of the deep-sea explorer's thrilling dive into a strange world of luminous creatures begins on page 136. He still hopes to reach 6000 feet.

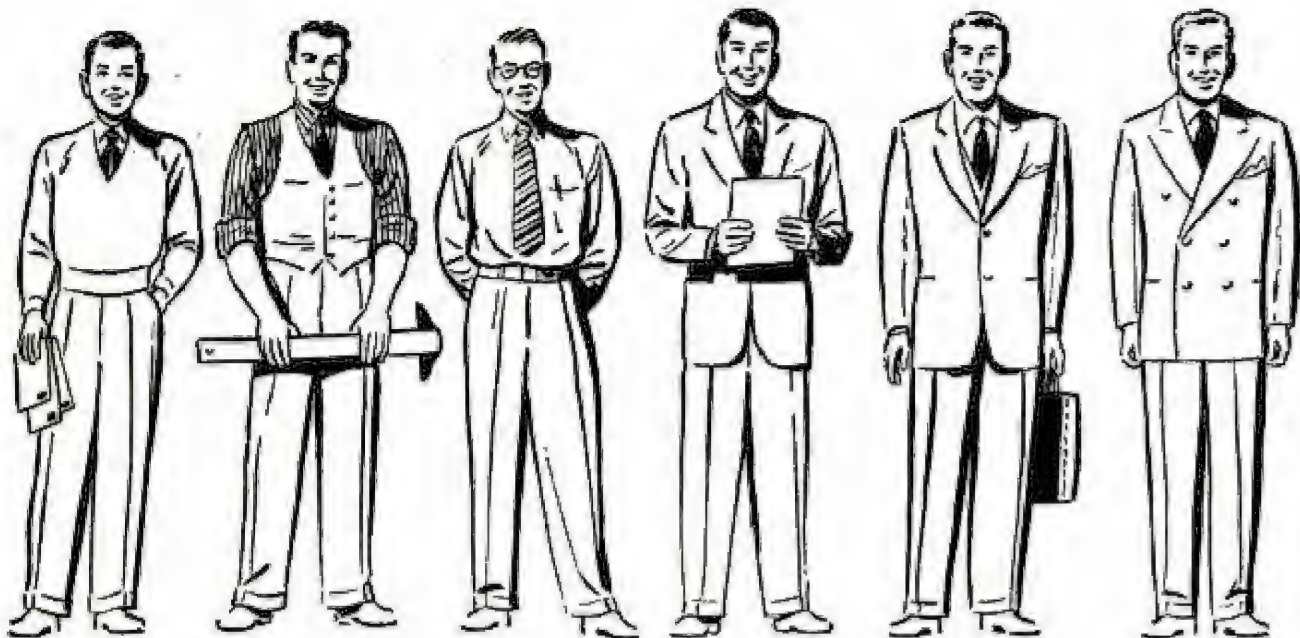


* * *

Plastic Engine Runs

Haydn D. Smith, a reader in Orpington, England, sent in this picture of a horizontal steam engine he built of transparent plastic. Most of the engine was cut from solid plastic with a bandsaw and the cylinder was bored and polished in a lathe, as was the bore of the piston-type valve. The engine runs on compressed air. The base plate is 4 by 10 inches and the flywheel is 4 inches in diameter.





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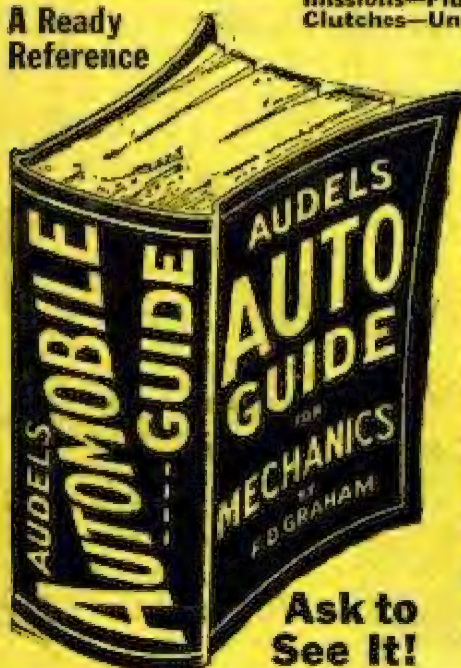
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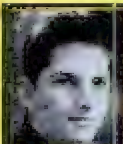
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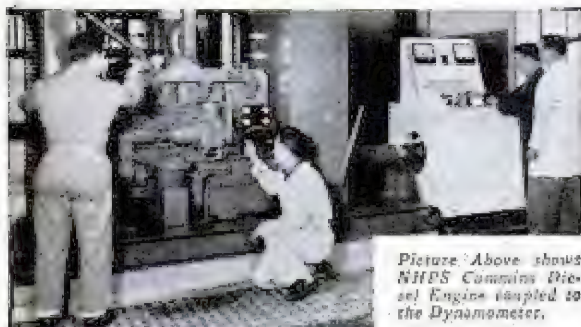


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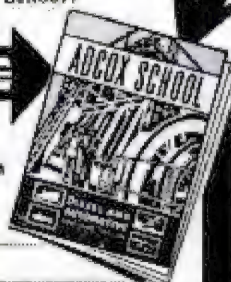
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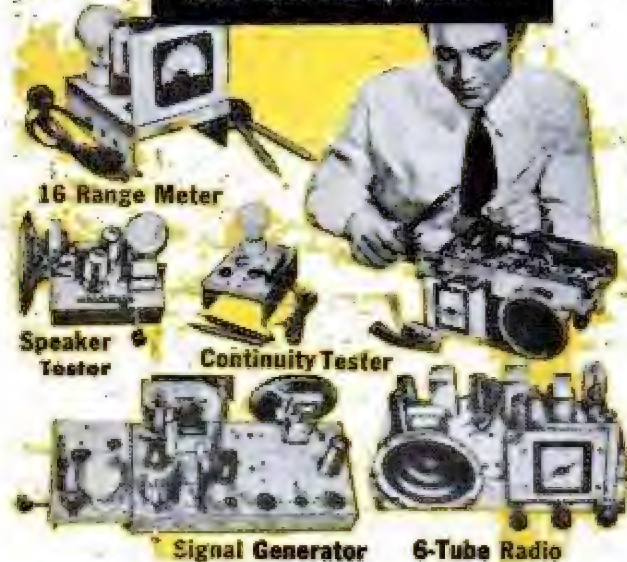
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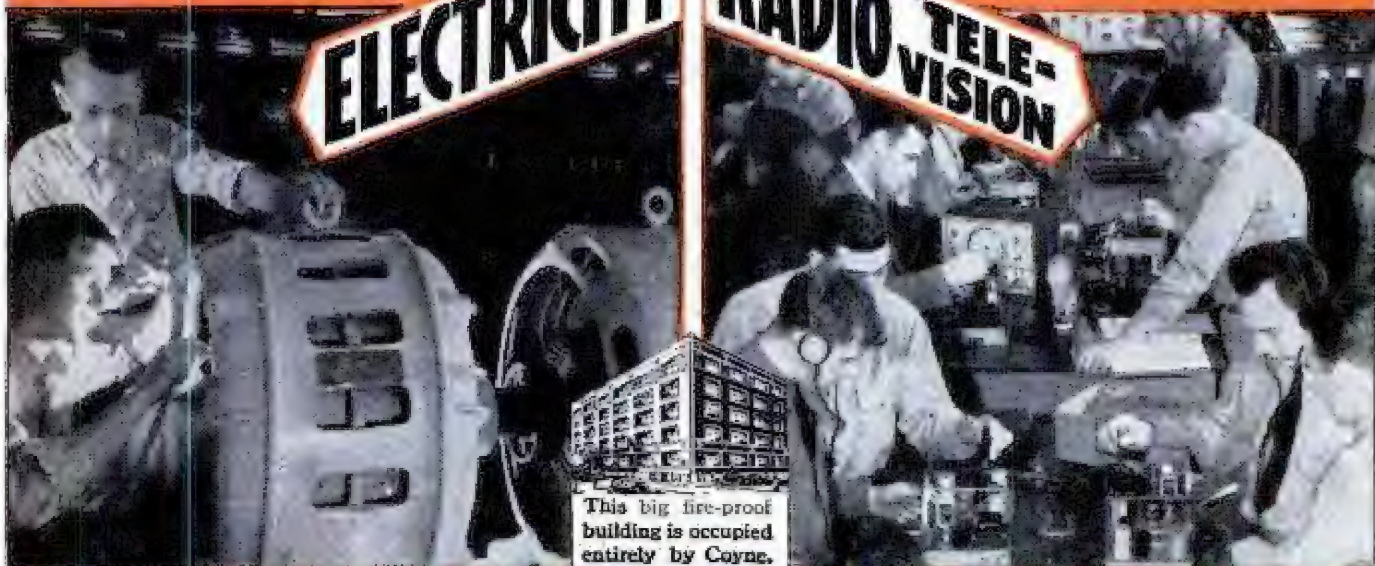
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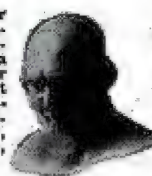
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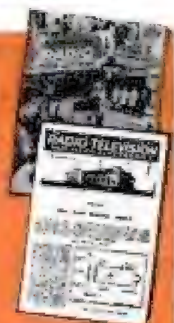
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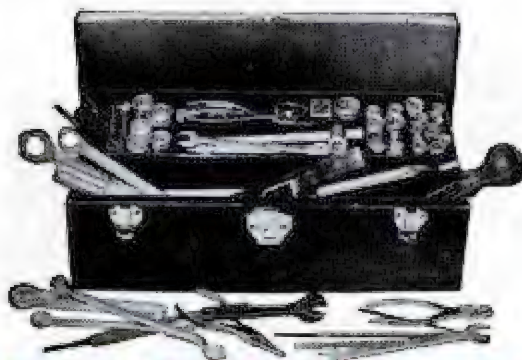
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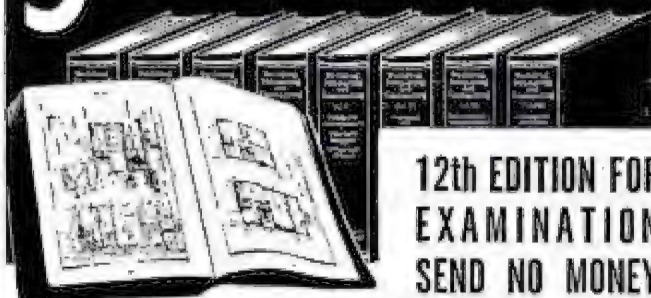
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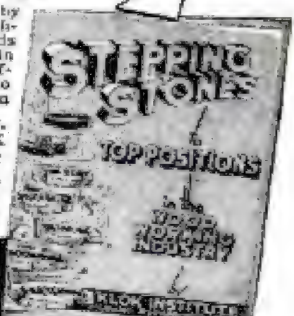


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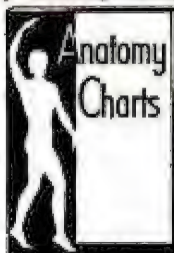
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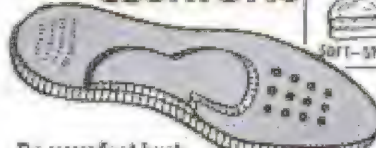
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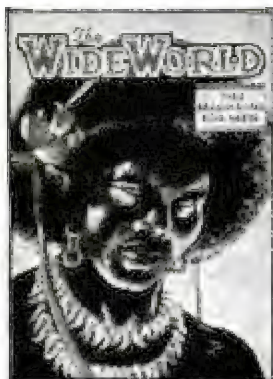
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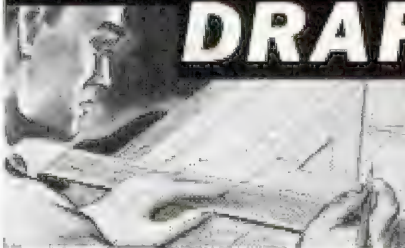


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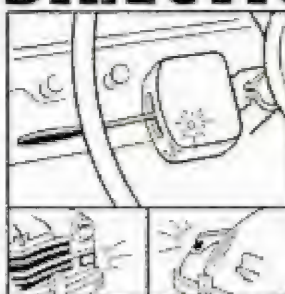
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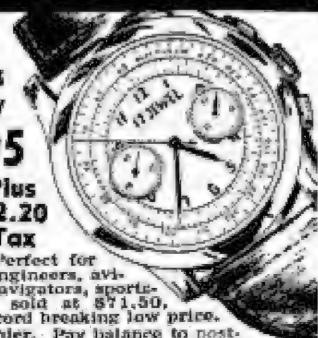
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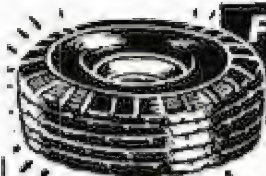
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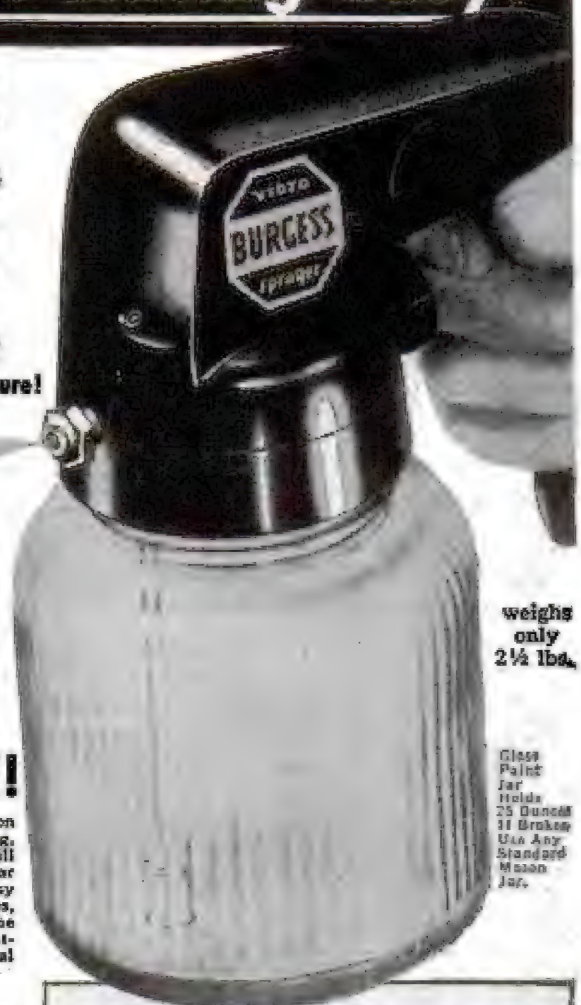
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I MAKE Big money in the mail-order business. You can do the same at home with copyrighted system. Write me. I'll tell you how. F. Little, R.D. #1, Glenshaw, Penna.

POPCORN Equipment, potato chip outfits. Long Bakins Company, 4960 Hi Street, Springfield 99, Ohio.

READ "Advance"—The voice of mail order. Offers money-making opportunities, sources of supply, personal guidance, etc. Issued monthly. Sample copy 25c. Yearly subscription \$2.00. Advance Publishing Company, 313 East 21st Street, Suite 450, New York 10, N. Y.

A BUSINESS in your own home! Our chemicals, plus free water and cheap "grocery store" materials can bring you over \$500 monthly earnings. Plans and formulas free. Chemica Division, 1299 S. Norton, Los Angeles 6.

A FACTORY in your home garage! Mfg. and sales rights, mechanics' waterless hand cleaner. \$500-\$800 monthly. No special equipment necessary. Formula free. Western Aircraft Mfg., Dept. D, Los Angeles 6, Calif.

START Mailorder bookshop—Everything furnished. 25c brings booklet, samples, exciting ideas. General Publications, Ossining, N. Y.

OPERATE Profitable mail order business. Write Walter Service, 4159-A East 112th, Cleveland 5, Ohio.

COLORGLAZED Concrete pottery made without molds. Patented method. Cemetery products, novelties, tiles. Basement leak-sealing. Money-making projects. Booklet, details free. Men only. National Potteries Company, Grand Rapids, Minnesota.

\$25 WEEKLY Working two hours daily. No canvassing. No manufacturing. Lycke, Box 2471, Cleveland 12, Ohio.

137 WAYS To make money, in home or office, business of your own. Full particulars free. Elite Co., 220 Grand St., New York 13.

BRUSH Plating outfits connect to a battery. No tanks necessary. Good paying business at home plating autoparts, bathroom fixtures, bicycles, reflectors, silvering mirrors. No shop or experience required. Outfits furnished. Free booklet. Gunmetal Co., Ave. H, Decatur, Ill.

COPUBLISH Leading m.o. paper. Latest copy Mail Sale Advertiser and proposition, dime. Vanvor W. Shirk, Lebanon, Penna.

MONEYMAKING OPPORTUNITIES

SECRET Investigations. Experience unnecessary. Write, George Wagner, 125-M West 86th, New York 24.

150% PROFIT. Two sensational new non-competitive low priced items for all salespeople. Cobrecite Corp., 335 W. Washington, Pasadena 3, Calif.

DEPRESSION Insurance! Own profitable business. Information free. Pru-A-Ex, Kingsport, Tennessee.

MAKE Money with imprints. Instruction book and big mail 25c. J. M. Stenger, 500 30th St., Rock Island, Ill.

NEW, Highly profitable, easily sold packaged button assortments. More than doubles your money. Write Capital Findings, 475-P Fifth Ave., New York 17.

WIN Cash, cars in prize contests! Write for copy filled with current contests, winning hints and tips. Send only 25c. Wright Contest Digest, Dept. 17-K, P.O. Box 2266, St. Louis 9, Missouri.

FREE Book "372 Unusual Worldwide Businesses." Successful! Australia, South America. Work home (U.S.A.)! Delightful plans. Get surprise! Publishers-7S, Carlsbad, Calif.

PRACTICAL Money-making opportunities. Details free. Resco, 308 East 8th, New York 3.

MAKE Money with easily installed weatherstripping. Double Seal Co., 2725 Ross, Waco, Texas.

TIP Top salesman magazine for money-making. Trial three months subscription 25 cents. "Superlux Opportunities" included. Louis J. Wiltsch, Co-Pbl., Steelville, Mo.

FREE Money-making literature. Plain. Sensible. Sure. Granite House, 675 Congress Street, Portland, Maine.

FREE Samples—Engraved wedding invitations, 100 for \$9.50. Berlin, 166 Keap St., Brooklyn 11, N. Y.

ODD, Unique and unusual items. Profit 100% up. Details, imprinted weather forecaster 10c. Refundable. Central, Simpson 1, Kansas.

YOUR Mail order business now ready. A. S. Spencer, Mokena 6, Ill.

HAVE Your own big-money business! Others are making up to \$500 monthly in waterproofing and cement painting. Let me prove you may do as well! Few dollars starts you. Interesting facts, free. Write today! Edgar W. Thomas, Barnesville, Ohio.

BUY, Sell, trade, thru the Trading Post Magazine. Free offer! Thorne's, 525-Z Dewey, Jackson, Michigan.

UNUSUAL Backyard money-making opportunities! Fully outlined! Pickett's, 62-M Sanders, Florence, Ky.

EARN Money evenings, copying and duplicating comic cartoons for advertisers. Adservice, Argyle 1, Wisconsin.

SELL A new product by mail. Big profits. Everything furnished. Write Home City Services, Box 1062PM, Springfield, Mass.

WOULD You pay 3¢—first \$350 made? Illustrated book "505 Odd Successful Enterprises" free! Work home. Expect something odd! Pacific, Oceanside, Calif.

15 MINUTES Masters advertising and sign lettering, complete system; sign painters' secrets; cartooning book; all three, \$1. Free circular. Abenterprises, Box 875-M, Peoria, Illinois.

PROFITS and fun with your pen. Sensational raised letter engraving. Gold, silver or copper. Engrave Christmas cards, stationery, invitations. Simple as writing. Amaze your friends and make money. Free sample! Specialties Clearing, 5520 Ethel Ave., Van Nuys, Calif.

WIN Contest prizes regularly! Others do! 10c brings latest issue "Contest Player," other revealing information. Lawrence, 687 Morgan, Camden 4, N. J.

MAKE Extra dollars! Full, spare time, home mail business. Start small, grow. Easy, pleasant. Facts free. Kanick, 261-A East Abbott, Lansford, Penna.

\$50 WEEKLY While learning watch repairing. See ad page 47.

\$25.00 CASH For handing out only 10 coupons on cheap oil burner for cooking, heating stoves and furnaces. Write today for details. Northwest Mfg. Co., Dept. 601, Mitchell, S. Dak.

EARN Money at home! Thousands do! "Home Worker Magazine" tells how. Sample, 25c. Sizemore, Box 7, 4917 Kostner, Chicago 30, Ill.

SCHOOL Seniors—Sell classmates America's most beautiful graduation name cards. Largest selection, 40% commission. Outsell all others. Free sample kit. Printercraft, Dept. M, 1425 E. Elm St., Scranton 5, Penna.

MAKE Money at home as renewal headquarters for all magazines. Big profit in Christmas gift sales. Liberal commissions. Supplies furnished. Catalog free. Write McGregor Magazine Agency, Dept. 509C, Mount Morris, Ill.

\$100.00 PLUS 24 card tables. Churches—organizations write for particulars. Box 382, Clementon, New Jersey.

EXCEPTIONAL Money-making opportunity making life-like dwarf trees. Tremendous market! Big profit! Complete sample kit \$3.95. Oriental Gardens, 1491 E. Colorado, Pasadena, California.

THOUSANDS Articles wholesale. "Supply Source Directory" 10c. Ideal Service, Park Ridge 30, Illinois.

DOLLARFUL Ideas for you every month in advance—"Voice of Mail Order." Leads the field in exclusive supply sources. Plans for mail order operation; new products, etc. Details free. Advance Publishing Company, Suite 350, 313 East 21st Street, New York 10.

START Profitable home business in spare time. Make extra money raising Golden Hamsters. Small, clean, odorless. New. Unlimited market. Literature free. Golden Gate Hamstery, 631-H Richmond Street, El Cerrito, California.

READ Progressive Mailtrade, the magazine that tells how to make money by mail. Dime brings sample and special offer. Progressive Mailtrade, Box 357, Sheboygan, Wisconsin.

PROFIT With Larson Leathercraft. Belts, purses, 100 other ideas. Largest supply in U. S. Catalog 10c. Larson, Dept. C, 824 S. Tripp, Chicago 24.

WIN Contest money. General Contest Bulletin gives hundreds of tips. Lists current contests and rules. Sample 25c. General Contests, 1609½ East 5th, Duluth, Minn.

PUBLISH Your own magazine. Hand-some 52 page format, well edited, illustrated. Cost low as \$1.00 month. Brings you prestige, profits. 25c brings sample, details. National, Ord, Nebr.

PRIZE Contest bulletin gives various contests now operating, and valuable hints. 3c stamp. National Contest Bulletin, Box 2485F, Miami, Florida.

FORMULAS, PLANS, ETC.

10,000 FORMULAS And trade secrets. Free literature. Stillman, 555 Kingston Ave., Brooklyn 3, N. Y.

FREE Formula catalog. Anything analyzed \$20.00. Western Chemical, Salem, Oregon.

MAKE—Sell cleaners, soaps, polishes, flavors, cosmetics. No machinery. Formula literature free. Kemico, Park Ridge 16, Illinois.

PRODUCTS Analyzed. Duplicated. Improved. Formulas. Consulting Scientific Company, Swarthmore, Pennsylvania.

FORMULAS For nearly everything. Catalog free. Write Creative, Winnetka, Ill.

TESTED Formulas. Interesting descriptive booklet free. Pont, Box 635-PM, Terre Haute, Indiana.

REAL Manufacturing formulas. Lists free. Cummings, Chemist, Gordon Ave., Syracuse 4, N. Y.

PLASTICS

WHOLESALE Plastics supply catalog. 10c. Lucite, clear, colored. Metallic Acetate. Complete Castolite line, phosphorescent, pearling pigments, dyes. Metal findings. Tools. Ideas and bargains galore. Fast delivery from stock. Gem-O-Lite, Box 686-10E North Hollywood, Calif.

HOW To make money in plastics. Learn plastics at home, in spare time. You get 7 big plastics material kits with training course. Make useful, valuable articles as you learn. Send today for free illustrated catalog. Plastics Industries Technical Institute, Dept. of West Coast University, 1601 S. Western Ave., Dept. CPM-109, Los Angeles 6, Calif.

PLASTIC Engineer and consultant. Will solve your plastic problems. Fee reasonable. 65 E. Rich Street, Columbus 15, Ohio.

MOULD Sparkling plastic, complete instructions. \$1.00 cash. Money order. D. O. Ford, 201 Dullin Ct., San Antonio 10, Tex.

CASTING Plastics: Cold curing, transparent and colors. Information 10c. Alan Plastics, Dept. P2, Box 3564, Cleveland 18, Ohio.

INJECTION Molding press—Do injection molding of all thermoplastics in your work shop. The Plasti-Jector injects 1/4 oz. plastic per shot and up to 75 shots per hour. Fits in drill press or arbor press. Stock lead molds from \$1.00 to \$5.00. Sent postpaid cash with order or C.O.D. \$19.75 plus mailing cost. Guaranteed. Merman Products Company, Box 67, Mercer, Penna.

LUCITE, Plexiglas. Any size sheets, masked. Square foot (12 x 12) cost, 1/16", 98c; 1/8", \$1.25; 3/16", \$1.52; 1/4", \$1.80. Colors add 10%. Include 10% postage. Almac Plastics, 230 Fifth Ave., New York 1, N. Y.

INTERNAL Carved roses, orchids, swans, goldfish, butterflies, etc. Jewelry and gifts. Crystal Floral Novelty Co., Bound Brook, New Jersey.

PLASTIC, Sheets, rods, tubes, etc. Free list. Plastic Supply Co., 3901 N. Grand Blvd., St. Louis 7, Mo.

CHEMISTRY

SUPPLIES, Chemicals. Catalog 10c. Atlantic Laboratory Supply, 21 Wenham, Boston, Mass.

NEW Laboratory supply catalog of chemicals and apparatus. Contains many thousands of items with illustrations. Send 25c. Standard Science Supply Company, 1232 N. Paulina St., Chicago 22, Ill.

NEW Idea chemical and apparatus outfits for home experimenting. Photo-scales, microscopes, chemicals, biological and laboratory supplies in small quantities. Catalog 15c. Established 1931. John H. Winn, 1244 West 33rd Street, New York, N. Y.

NEW Catalog: Chemistry, mineralogy, biology. 10c. Tracey Laboratories, Evanston, Illinois.

CHEMICALS And apparatus for industrial, analytical, and private laboratories. Catalog 15c. Dept. M-50. Biological Supply Co., 1178 Mt. Hope Ave., Rochester, N. Y.

HELP WANTED

BOYS Wanted. Over \$2.00 hour! Sell name plates for front doors. Free sample. Write Dept. 53, National Engravers, 214 Summer, Boston, Mass.

AGENTS WANTED

WORK Garments and embroidered uniforms, wool or cotton. Thousands of prospects. Outfit furnished. Dodson Sales, Box 480C, Roanoke, Virginia.

WONDER Metal (putty). Fill holes, leaks and cracks in all metal articles. Fireproof. Applied with fingers. Hardens like iron. Repaired articles can be used at once. Cooking utensils, hot water heaters. Boilers. Tanks. Radiators. Pipes. Salesmen's large size 25c. Home Chemical Co., 143 West Florence, Los Angeles, Calif.

AT Last! Something new and sensational in Christmas cards. Show gorgeous satins, velours and plastics never before offered. Gets easy orders fast! Pays big profits. Free samples of Christmas cards with name 50 for \$1, imprinted stationery, floral charmettes, napkins. 50 other assortments 50c to \$1.25. Samples on approval. Write. Puro Co., 2801 Locust, Dept. 940-M, St. Louis, Mo.

FREE! "How to Make Money" booklet with fast-selling Christmas cards on approval. Credit to clubs. Writwell, 2110 Transit Building, Boston 15, Mass.

PLASTIC Christmas, Christmas wrap-pings, complete line, everyday & Christmas including 25 and 50 for \$1.00 imprints. Gaycraft, 4228 Paul, Phila. 24, Penna.

"GEM-LITE" Luminous paint (glows in dark) colors: blue, green, yellow, violet. Jar \$1.00. Complete kit \$3.50. Polders. Gem-Lite Products, 12691 Charest, Pm., Detroit 12, Mich.

\$1.00 STARTS You in business. Sell men's neckwear full or part-time. Low investment, big profits. Send \$1.00, receive two sample ties, plus free catalogue, color pictures, selling plan. Radio City Neckwear, Dept. M3, 112 W. 50th St., N. Y. C.

NYLON Uniforms. Immediate delivery, immediate profits. Sell to doctors, dentists, nurses, waitresses, beauticians, housewives. Free sales kit. Superior Fabrics, Dept. P10, 3936 Market, Philadelphia 4, Penna.

WEDDING Invitations—Lowest prices, 24 hour service, free samples. Sperry-Print, Williamsport, Penna.

EARN Extra money. Sell our perfumed air fresheners. A useful household deodorant in a decorative wall plaque. Many beautiful styles to choose from. Wonderful Xmas line. Big profits plus bonus. Write today for details. Sydray Company, 1186 Broadway, Dept. M, New York 1, N. Y.

BIG Extra income! Sell friends nylon hosiery, lingerie, blouses. Values supreme! Free sample displays. Christmas, everyday greeting cards, gift wraps. Christmas samples on approval. Special outfit offers. Wear Wright, 1709 Arch St., Dept. B, Philadelphia, Pennsylvania.

DOUBLE Your income selling sports-wear, shirts, pajamas; Nylon lingerie, hose, housedresses. Free outfit. Jared Manufacturing, Rockville Centre 88, New York.

100% PROFIT—Suresal steel bottle recapper and opener. Retail 25c. Sell on sight. Agents selling dozens daily. Sole distributor, G. Kearney, 180-7th Ave., New York 11.

EXTRA Money yours—Easy! Profits to 100%. Sell thrilling value plastic Christmas cards, 50 for \$1.00. Personals, everyday, religious, children's, gift wrap assortments. Request deluxe 21-card \$1.00 Christmas assortment, name imprinted Christmas cards, stationery samples on approval. Holiday Card Co., 463 Congress St., Dept. C, Portland, Maine.

BUY Thousands of nationally advertised products direct from manufacturers and distributors. Write for "Buy Direct and Save." Service Publishing, 218-A Investment Bldg., Pittsburgh 22, Penna.

CHRISTMAS Cards. Earn \$5.00 with every ten 21 card \$1.00 boxes you sell. Also new \$1.00 plastic cards, personalized cards, and stationery, note paper and wrappings. Send for samples today. Howard F. Ellis, Dept. PM-10, Pitman, N. J.

25c SCISSORS Sharpeners. Fine sales in every home. Campbell Doggins, Box 949, Lexington, Ky.

AMAZING Offer—\$40 is yours for selling only 50 boxes Christmas cards. Also 50 and 25 for \$1.00 with or without name. Free samples. Other boxes on approval, including entirely new, different deluxe assortment with feature television card. Cute plastic assortments. Write today. It costs nothing to try. Cheerful Card Co., 981, White Plains, N. Y.

STEADY Profits selling new sensational Lico fountain pens. Liberty International, 8 Bridge St., New York 4, N. Y.

NEW "Sponge" dish cloth. Replaces messy dishrags. Banishes dishwashing drudgery. Lightning seller. Samples sent on trial. Kristee 136, Akron, Ohio.

MAKE Money easily. New spare time plan. Up to 100% profit. No experience. Show unusual Christmas, everyday card assortments, plastics, Glean and Glo, Kiddies cards, wrappings. Attractive gift items. Bonus. Special offers. Send today for free samples 30 different Christmas cards with name 50 for \$1.00 up, stationery, coasters. Thomas Terry Studios, 102 Union Ave., Westfield, Mass.

MOVIE Projector 16mm sound. Sell churches, schools, industry. Big profits. Write L. Jessen, 5 S. Wabash, Chicago 2, Illinois.

MORE Money—Yours! Sell "guaranteed comfort" Air Cushion shoes. Big advance commissions, bonuses. Special shoe offers. New style sensations. Complete line. Experience unnecessary. Free outfit. Merritt Shoes, P.M.S. Brockton, Mass.

NUSILVER Plating liquid. Apply with cloth. Renews silverware. Silverplates brass, copper. Easy seller. Nusilver, 608-10PMA New York St., Aurora, Illinois.

WANTED! Direct from factory to customer salesmen for guaranteed shoe line. Unusual factory fitting service. \$1.00-\$3.00 advance commissions. Bonuses. Experience unnecessary. Free starting outfit. Mench Shoes, 10D, Brockton, Mass.

SELL New clothing. Lowest prices. Operate from home, auto, store. Enormous profits. Big catalog free. National Mail Order, 1219-A So. Jefferson, Chicago 7, Illinois.

MANUFACTURE Foam cleaner at home. Gallon costs 5c—sells for \$1.60. Full details with 1/2 gallon size 25c. Kohne, 506 West 45th, Chicago 9.

WANT Some money quick? California sweet smelling beads sell on sight. Big profit. Particulars free. Mission, 2328P West Pico, Los Angeles 6, Calif.

BEAUTIFUL Mexican bird pictures. Hand made of real feathers. Profitable. 9" x 11" sample \$1.00. Refundable. Miclak, 241-25 86th Ave., Bellrose, N. Y.

LOOK Here! Wanted—Men and women to start in business on credit. Sell some 200 farm-home products. Thousands our dealers now make quick sales, big profits. For particulars write Rawleigh's, Dept. J-192-PPM, Freeport, Ill.

A Dress yours with every 3 you order for yourself and family. Amazing new bonus plan. Everything free. Harford Frocks, Dept. A-535, Cincinnati, Ohio.

"CLEAN Dry" clothes brush. Chemically treated. Cleans clothes while brushing. Lightning seller. Samples sent on trial. Kristee 136, Akron, Ohio.

SPARE Minutes bring dollars selling this new burn ointment. Free details. Clover Products, 11860M Mississippi Ave., Los Angeles 25.

SHARPMASTER Reflector—Amazing new invention that will keep double edge razor blades sharp indefinitely. Feather-light shaves without nicks or skin irritation. Satisfied customers say: Magnetic shaving is out of this world. Whirlwind seller wherever demonstrated. Beautifully packaged. Unconditional money-back guarantee. Exclusive sales contract for five years. Send \$2.00 for sample, complete information and quantity prices today. Rhoads & Associates, Dept. 101, Box 1711, Detroit 26, Michigan.

DISTRIBUTOR Agents for patented Frost Proof shut-off valves and yard hydrants. Small capital and stock required. Miller Frost Proof Valve Co., Ironton, Mo.

ASSEMBLE And sell electric bed warmers. 400% profit. Altozco Co., 7811 Guthrie, Cleveland 2, Ohio.

AGENTS Make big money selling exciting new game. It's sensational! No competition! Everybody wants one. Free information on how to make \$30.00 or more a day. E. G. Stadler Co., 1142 North Vermont, Los Angeles 27, California.

SELL Scots guard automatic fire alarms. Retail for only \$3.95. Write for details. Royal Scot, Waterbury, Conn.

MUSIC Greeting cards. All occasions. Dorby Music Cards, P.O. Box 738, Morristown, New Jersey.

AMBITIOUS Agent's opportunity! No initial investment. No overhead. Hundreds of profitable gift, household products! 38th year. Toby of Chicago, 14 W. Lake St., Chicago 1, Ill.

FREE Nylons given if Kendex hosiery runs or snags! World's only women's hosiery sold with written guarantee amazing everybody. Mere words could not express unbelievable money-making opportunity. Fantastic earnings become reality. Armstrong earned \$202 in 9 days. Watkins sent 92 orders in one day. Imagine replacing hosiery free regardless of cause—whether use or abuse! Truly sales dynamite for terrific profits. Even if you never sold before, three magic words: "Guaranteed Against Everything" will open doors for you—make women listen and pour money in your pocket. Nationally advertised in Life, Ladies Home Journal, Saturday Evening Post, McCall's and Woman's Home Companion. Awarded Seal of Approval by Good Housekeeping. 75 million readers will see Kendex advertising to help you make quick sales and big money. Complete line from sheerest 15 denier 51 gauge to heavy 70 denier service. Sizes 8 1/2 to 11 1/2; lengths 28 to 35 inches; latest fashion colors plus white; full fashioned seamed and seamless. No competition because Kendex nylons are not sold in stores. Also complete line men's hosiery actually guaranteed for one full year or replaced free. Nothing like this anywhere. Includes rayon, nylon, lisle, wool, cotton, mixtures etc. All styles, patterns, colors, prices to please everybody. 200,000 pairs constantly in stock for fast delivery. Thousands shipped daily. Over 30 years in business. You need no money or experience. Nothing to pay now or later. Just show free outfit. Write orders. We deliver and collect. Big advance cash plus huge bonus. Earn money spare or full time—exclusively or as side line. No restrictions. Become manager—appoint others to sell for you—earn steady income on their sales. Man or woman, young or old, experienced or beginner, you can make money and friends writing orders. Everything you need is furnished free, including sales books in color, samples of hosiery materials etc. Simply write your name and address on postcard and make money next week with money-making outfits sent free and prepaid. No obligation. Kendex Company, Babylon 13, N. Y.

SELL New item to grocers, butchers, delicatessens. Good sideline, no competition. 30% commission. 3 sales daily nets over \$10. Send card McArthur Price Tag Holder, 102 W. Summit St., Souderton, Pennsylvania.

ATTENTION Picture men: Air brush portraits. Frames. Tinted prints. Commercial Copy Co., Box 1695, Chattanooga, Tennessee.

WRIST-WATCHES, Reversible neckties, Nylons, blades, pens, cameras, typewriters. Shims, Warwick, N. Y.

YOUR Own successful business—Experience unnecessary. Big profits waiting. Make 1001 items for sale. Do profitable business with manufacturers. Help ill huge demand. New Miracle Finish makes old items beautiful, new items worth much more. It is easy. Write now. Free samples and booklet containing powerful money-making plan. Coast, 1004H So. Los Angeles St., Los Angeles 15.

BABY'S Footprint reproductions in bronze relief. Solid metal, hanging ring and easel stand. Liberal commissions and protected territories. Write to Hanson Arts, 253 Ruggles Street, Boston 15, Mass.

PROFITABLE Business selling creme, waxes, polishes. Samples \$1.00 postpaid. Refundable. Valtex Company, Rochester 7, New York.

BIG Money—Fast! Sell plastic tablecloths (from \$3.50 doz.), drapes, aprons, over 300 other items. Cash advanced daily. Lowest factory prices, highest quality plastics! Huge selling kit free! The Dur-Ever Co., 2781-G Atlantic Ave., Brooklyn 7, N. Y.

PAINTS—Enamels. Roofing 65c gallon up. Also outdoor toilet cleaners. Certified Products, 812c 38th, Louisville, Ky.

MEXICAN Feather pictures Christmas novelty. \$1.00 (stamps) brings \$2.00 worth samples, details. Refunded if unsatisfied. Aztec Art-P, Apartado 762, Mexico City.

PERFO—The leader in its field—has full line of custom-built rubber mats with inlaid names, numbers and trademarks. Big commissions paid in advance to hundreds of successful representatives. Write for details on this year's round business today. Perfo Mat & Rubber Company, Inc., Dept. PM-1, 281 Fifth Avenue, New York 16, New York.

BIG Money selling tooth powder. J. Walker, 533 Plymouth Ct., Dept. 1, Chicago 5, Ill.

AMAZING New Sahara Waterless Hand Soap. Sell to jobbers, stores, factories. Exclusive territory. Sahara Waterless Soap Co., Grand Rapids, Michigan.

SELL Ultra-blue stock signs to stores. 1000 slogans, comedy, general, religious. "7x11" cost 6c, sells 35c. Make money. 15 samples ultra-blue signs "7 x 11" \$1.00 postpaid. Lowy, 8 West Broadway, Dept. 494, New York City 7.

QUALITY Plastics at lower prices! Proven hits in tablecloths, aprons, garment bags, utility covers. Free catalogue M910. Acclaim Products, 49 West 24th St., New York 10, N. Y.

MAKE Big easy money—Now! Make up to 100% profit. Sell new Xmas cards in boxes, plastic and regular. 43 famous assortments. Splendid opportunity for clubs, churches, to raise funds easily, quickly. Sample on approval. George Creed, 23 S. 10th St., Philadelphia 7.

NOGRIND Faucet stopper. Stops leaky faucets right now. Send \$1.00 for four assorted sizes and low agents' prices. F. K. Mfg. Co., 240 Pulaski Rd., Calumet City, Ill.

DON'T Sell our signs! They sell themselves. Your profit 400% while having fun. Colorful 7" x 11" signs. Slogans, comic, functional, novelties for every business—\$1.00. Generous starting selection. Retail for \$5.00. All Ready Signs, 501-A Piper Blvd., Detroit 15, Mich.

SELL Big money-maker to men and women. Easy handwork makes fast-selling useful articles. Sunmade Company, Brockton 64, Mass.

AMAZING Profits—Up to \$600.00 month. Working with churches, civic clubs, legion, money raising organizations. Easy, fascinating, permanent employment. Details free. Kraft, Aurora 3, Mo.

\$100.00 WEEKLY Selling 6 pair Paragon Cushion shoes daily. No investment. Experience unnecessary. Free outfit. Samples. Advance commissions, bonus. Paragon Shoes, 139 Columbus, Boston.

BE Renewal headquarters for all magazines. Big profit in Christmas gift sales now. No experience, no capital needed. Free catalog tells how. Write: McGregor Magazine Agency, Dept. 509A, Mount Morris, Illinois.

SCHOOL Seniors—Earn 40% commission selling classmates America's most beautiful graduation name cards. Largest selection. Outsell all others. Free sample kit. Printcraft, Dept. M. 1425 E. Elm St., Scranton 5, Penna.

IDENTIFICATION Tags for dogs, keys, luggage. Write: DuRaney, Johnstown, Pennsylvania.

SCHOOL Seniors! Your postal will bring our wonder, Kwick-Sell cardalog of popular graduation name cards. Biggest profits! Only firm giving free souvenir chest and card case. Don't miss out! Hurry that postal! Craftcards, Box 235 (L), Pittsburgh 30, Pennsylvania.

BIG Money taking orders: Shirts, ties, socks, pants, jackets, sweaters, shoes, uniforms, etc. Sales equipment free. Experience unnecessary. Nimrod, 4922-BG Lincoln, Chicago.

AGENTS: Stamping names on key protectors. Sample 25c. Stamping outfits, checks, social security and name plates. Hart Mfg. Co., 303 Degraw St., Brooklyn, N. Y.

\$5-\$25 DAILY. Full, sparetime or sideline. Pocket samples free. Embocards, 3333 Neenah, Chicago 34.

EASY To sell Bible text pencils, mottoes, charms, direct or to stores. Write, Al Hawkins Company, Sioux City 7, Iowa.

BIG Bargains for big profits. Over 100 sensational values. Men's used suits \$2, pants 35c, topcoats \$1.25, overcoats \$2, shoes 20c. Experience unnecessary. Free wholesale catalog. Superior, 1250-A Jefferson, Chicago 7.

A SURE Way to make money. No exp. needed; Christmas cards sell fast! From 50 for \$1.00 with name! Big line box assets; profit up to 100%. Write for samples on approval. Mandler Art Company, 37A Pearl Street, Boston, Mass.

1949 CHRISTMAS Card catalog now ready! Earn more money! Be a wholesale jobber! A large selection of box assortments. Imprint lines, religious, personalized cards and Christmas novelties. Three sample boxes, retailing for \$2.60, only \$1.00 postpaid. Catalog free! Elfkco, 440 North Wells, Chicago 10.

HOTTEST 39c item on the market. Write National Sales & Service, Greenville, Penna.

FREE Samples. Big profits showing amazing Glow-in-the-Dark specialties. House numbers, pictures, plastic novelties, religious and nursery objects, etc. Large manufacturer. Madison Plastics, 303 Fourth Ave., New York 10, N. Y.

ABSOLUTELY Free! Big package actual sample fabrics and style presentation of dresses, lingerie, hosiery, etc. Take orders. Commissions big. Send no money. Melville Co., Dept. 5103, Cincinnati 3, Ohio.

LOOK! Make money all year round selling personal initialed individualized belts, buckles, cap badges, western buckles, tie holders, name plates. 2000 emblems to choose. Big profits, whole or part time. Please write today special outfit offer. Hook-Fast Specialties, Box 1425, Dept. 6, Providence, R. I. Established 1926.

SEWING Machine electrification kit. Nationally advertised. Has Good House-keeping Guaranty Seal. Can be demonstrated and sold in 5 minutes. Make at least \$5 per sale. For complete details write today to Brownell Distributors, Inc., Dept. PM, 308 Canal St., New York 13, N. Y.

FREE Water and our concentrates, make flavors, lotions, shampoos, 125 products, labels, bottles supplied. Qualco, E20030 Russell, Detroit.

BE First! Clean up selling brilliant new, metal Christmas cards featured in America's greatest box assortment line. Special metal, plastic, foil and novelty assortments. Five portfolios of personal cards. Fast imprint service. Free samples. Elmcraft Chicago, 5930 South Western, Chicago 36, Ill.

MAGIC Cleaner—Laundry soap deal. Hotter than a firecracker. Big profits. Sample free. Bestco, 4642 No. Central, Chicago.

PHOTO-Salesmen-agents. Sell beautiful hand-colored plastic enlargements. Collect deposit, we deliver. Profitable sideline. Send card, for free sample kit. Novel Portrait Co., 3343 North Ave., Chicago, Ill.

GOLD Lacquered window sign letters. Large sizes penny each. New foils. Absolutely beautiful. Free samples. Atlas, 544 W. 79th, Chicago 20.

AGENTS—300% Profit selling genuine gold window letters; stores and offices. Free samples. Metallic Letter Co., 436-B North Clark, Chicago.

EXCELLENT Sideline for printing and advertising salesmen. Decalcomania name plates in small quantities. Great demand. Also, make money with our line of automobile initials and sign letters. Free samples. "Ralco" XL-Roxbury, Boston 19, Mass.

HIGH-GRADE SALESMEN

ADVERTISING Book matches—Cash in on big demand; sell union label matches. Cuts for all businesses and political parties. Free powerhouse selling kit, low prices, protection guaranteed on repeat orders. Cash commissions. Superior Match Co., Dept. M-109, 7530 Greenwood, Chicago.

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EXCELLENT Sideline for salesmen. If any of your customers use felt send us samples and details except names. Contact all factories in your area. Henry M. Nagel, Box 125, Boulder, Colorado.

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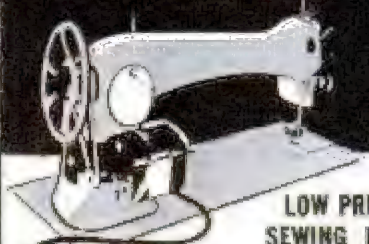
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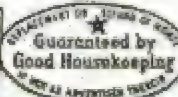


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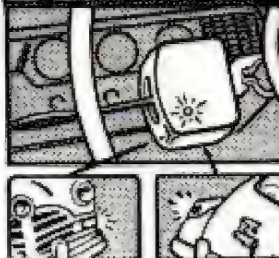
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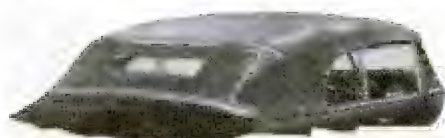
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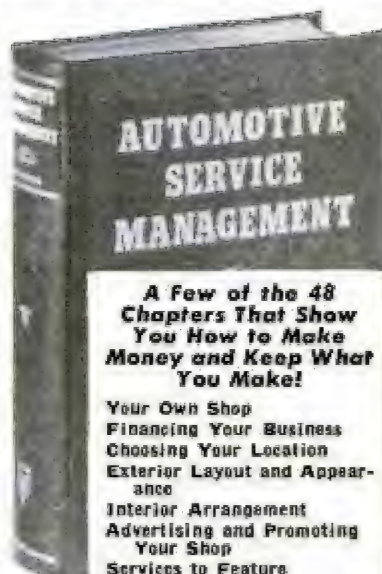
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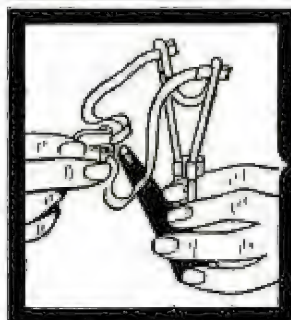
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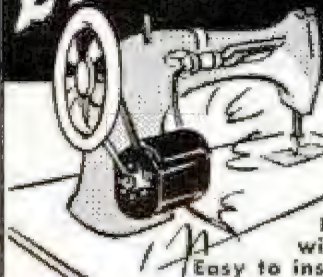
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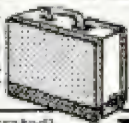
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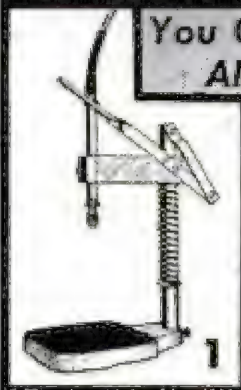


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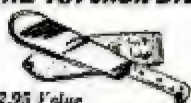
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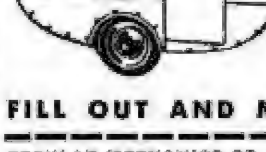
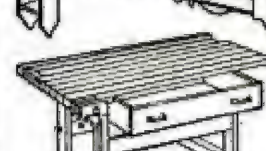
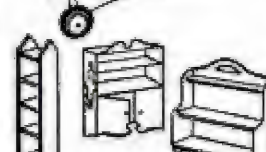
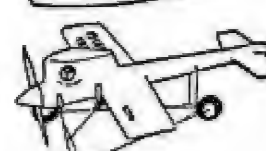
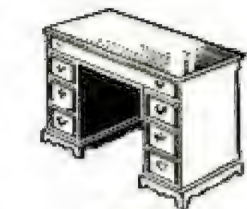
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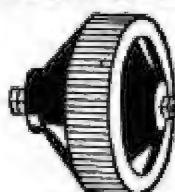


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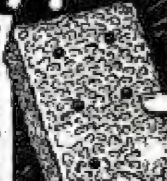
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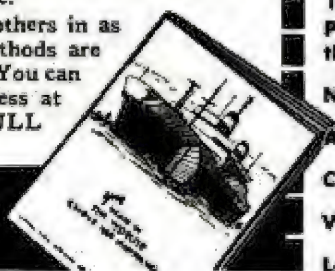
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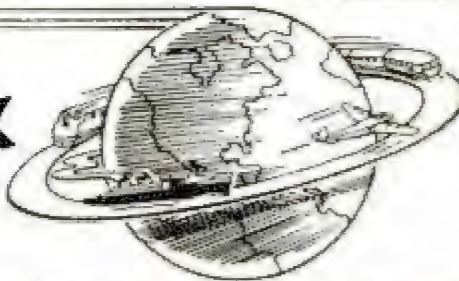
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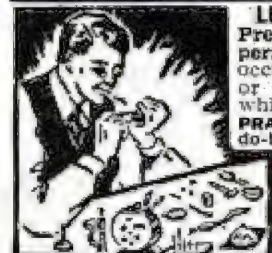


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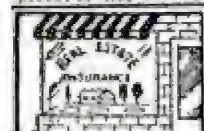
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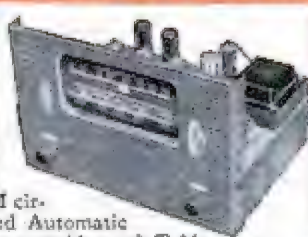
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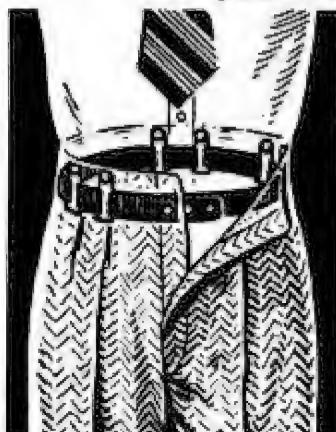
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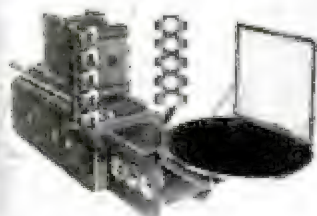
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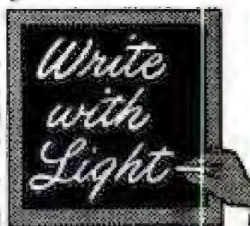
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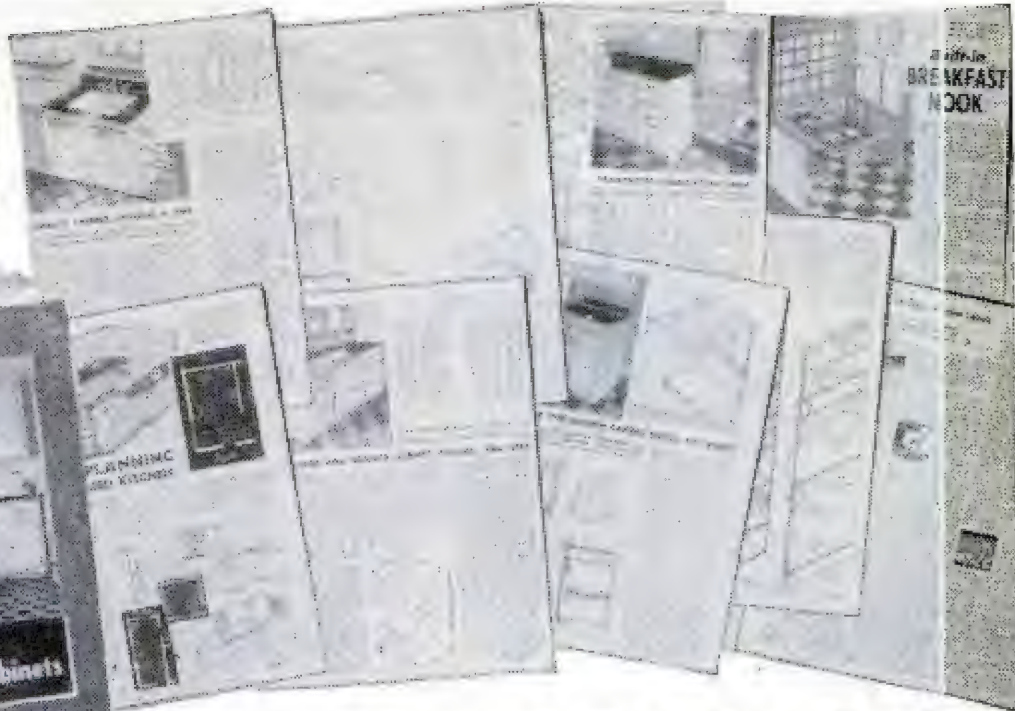
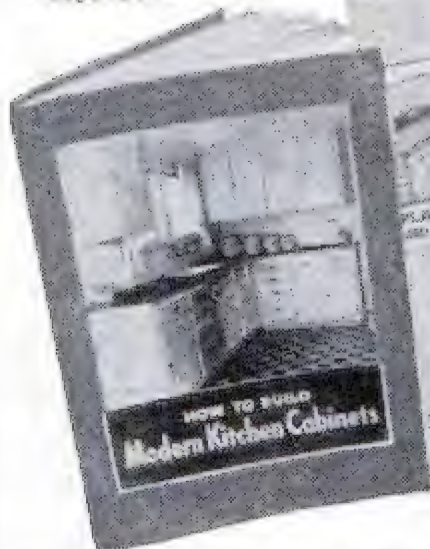
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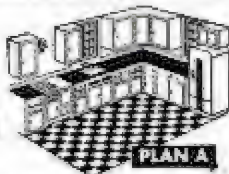
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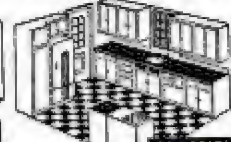
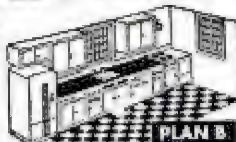
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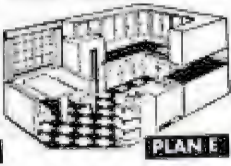
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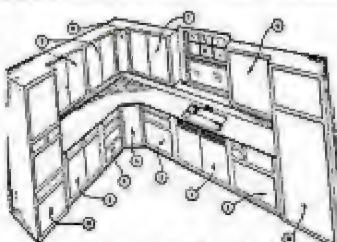
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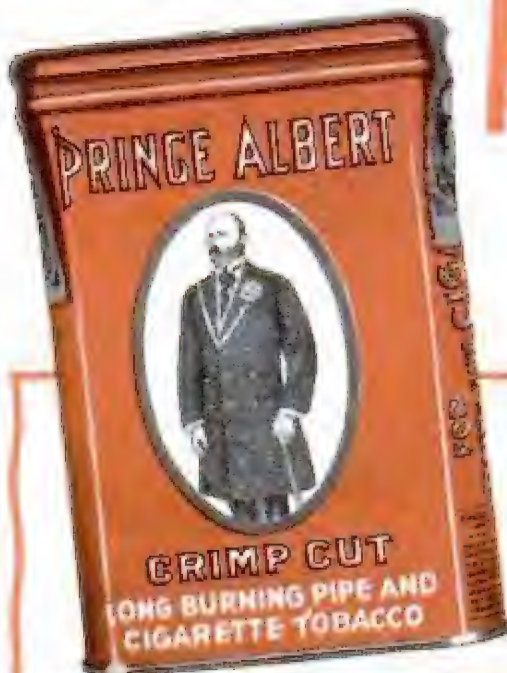
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WRITTEN SO YOU CAN UNDERSTAND IT
VOL. 92 NO. 4

Million-dollar baby of the atom age

By Wayne Whittaker

NEW YORK CALLING," said the operator. James A. Schoke, 25-year-old president of the Nuclear Instrument and Chemical Corporation in Chicago, picked up his telephone. An executive of a large sporting goods house was on the other end of the wire.

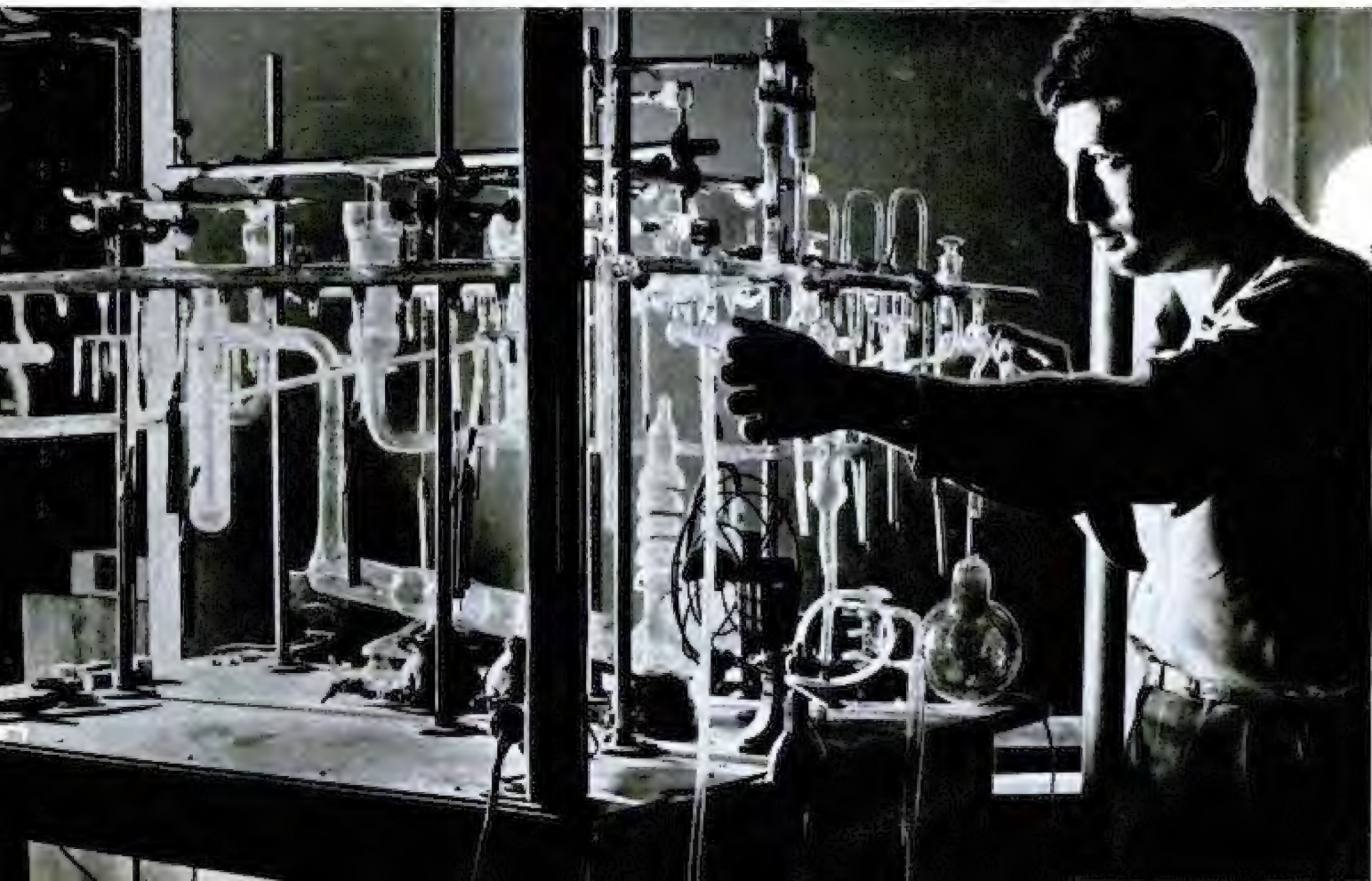
"When can you deliver 200,000 portable

Geiger counters?" the New York man wanted to know.

Even the youthful president of a business which has mushroomed in three years from a one-room store operation to a company with an annual sale of one million dollars in instruments was taken aback. What would a sporting goods firm want

James A. Schoke, 25-year-old president of thriving "atom age" company, tests vacuum system in laboratory

Photos by John Drew Atkins



with 200,000 Geiger counters? The counters are used for detecting radioactivity. Portable sets are popular with uranium-ore prospectors.

"We plan to make radioactive golf balls," said the sports executive, "and want the Geiger counters so players can find them in the rough. Do you think it's practical?"

Schoke thought a moment. "Possibly," he said.

Next year small metal boxes slung over the shoulders of thousands of caddies may

be the result of that long-distance telephone conversation.

Every day in some part of the world a new business is discovering jobs for radioisotopes. The rays loosed by cracked atoms perform wonders and new industries founded on nuclear fission have mushroomed almost overnight.

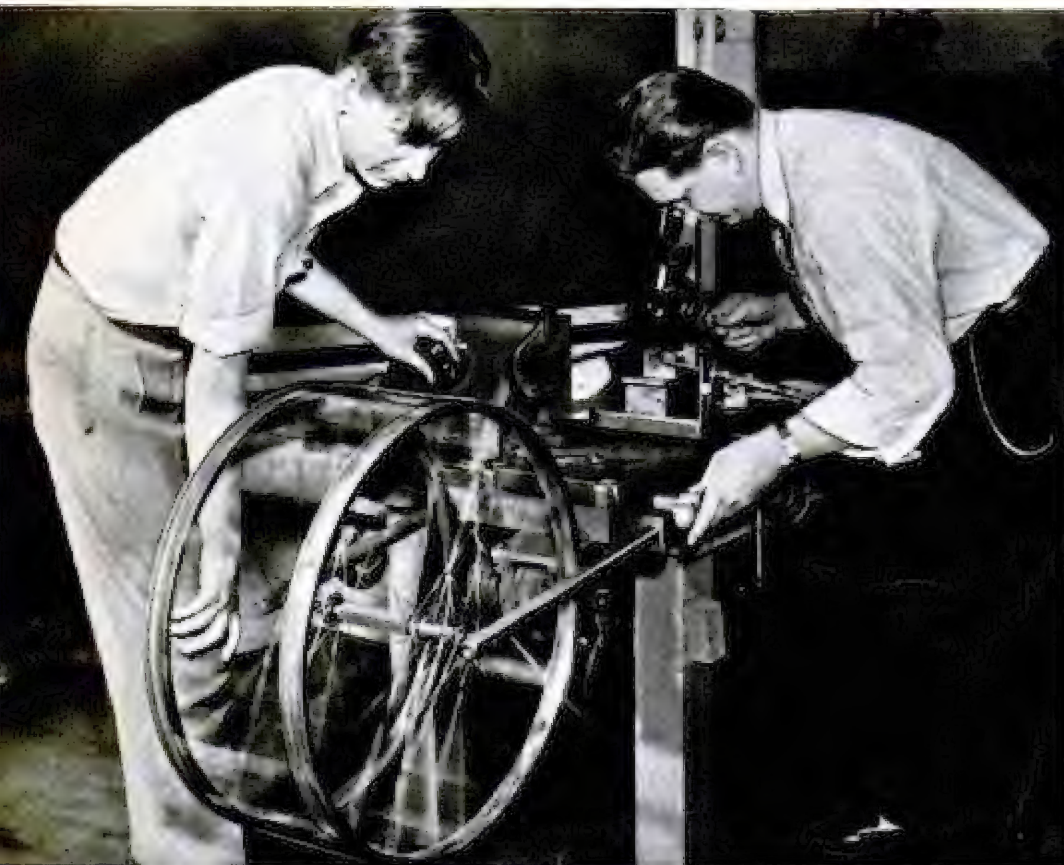
Nuclear is one of these companies. It was started in 1946 by four young scientists who helped build the atom bomb on the Manhattan Project at the University of

Chicago. After the war they rented a small space near the university and their business has flourished at such a rate that they will sell a million dollars worth of instruments this year.

Geiger counters are just one of their products. Their special instruments range from miniature tubes used in medical research to a huge 48-channel differential analyzer built to order for the Nuclear Institute at the University of Chicago. One of the smallest instruments made by the company will be inserted in a dog's abdomen to study the rate of blood flow.

In addition to Schoke, the other executives and co-owners are John L. Kuranz, 27, a physicist, vice-president and sales manager; Thomas E. Mitchell, 27, an electrical engineer and accountant, executive vice-president and general manager; and Emil Hinspater, 35, vice-president, engineer and production manager. The others occasionally call Emil "Gramp" due to his "advanced" age. Schoke, Kuranz and Mitchell were in the Corps of Engineers while working on the atom bomb and Hinspater served as a civilian.

The four young men learned to respect each other's abilities in the metallurgical laboratories of the project. Each had a different specialization and when Dr.



Emil Hinspater (right) company vice-president, calls this outfit his "mechanical spider." He built it for making fine quartz fibers. Here he is watching blob of molten quartz from which the strands are made as fine as $2/100,000$ inch in diameter. Below, a close-up of coarse strands of the spun quartz





Farrington Daniels, director of the laboratory, suggested that various groups should pool their efforts after the war, the four thought it an excellent idea.

"We knew all about the isotopes and their uses but did not know for sure that they would be made available," said Kuran. "We used to sit around a little room I had in the basement of Eckhart Hall on Saturday afternoons and talk about the future. It all concerned what you could do with those radioactive isotopes for civilians. At that time we didn't own a soldering iron between us."

Schoke laughed. "If we had had any business experience we wouldn't have dared attempt what we did. In our one-room store we had to compete with multi-million-dollar concerns with huge labs and big reputations."

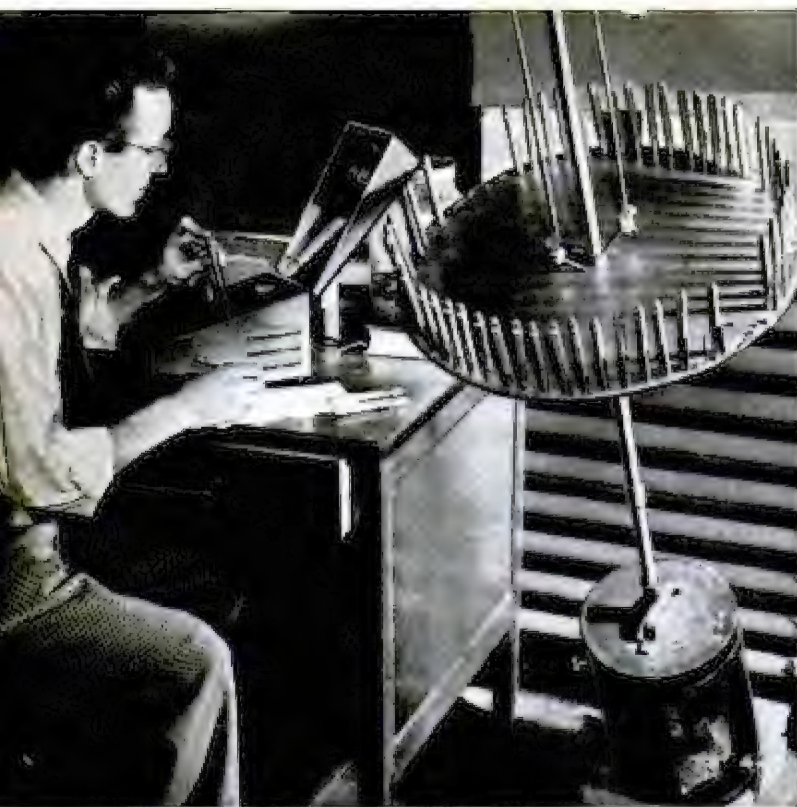
But these four men had something their rich competitors could not buy: know-how acquired on the atom-bomb project and friends who had scattered to strategic laboratories—many operated by the Atomic Energy Commission. Mitchell refers to this as a "chain reaction that worked in our favor." Today their long list of customers looks like a Who's Who of world business.

"I'll never forget our first sale," said Schoke. "We had worked for months without taking in a penny. A biochemist at the University of Wisconsin who had worked on the bomb project bought an electronic scaler. It amounted to \$280 and, believe

Girls on the assembly line are all specially trained and quality, not quantity, is the rule here. All four top executives of the company have worked on line

This 48-channel differential analyzer was built to record varied radiations of radioactive materials





John Kuranz testing pocket chamber such as is used by atom-laboratory workers to detect radioactivity

me, that seemed like a fortune in those early days."

They all refer to 1946 as "the early days."

Kuranz took up the story: "At that time the University of Chicago would not do business with us. We were so small they were afraid of us and you can't blame them. Mitchell kept saying, 'If we could just make one big sale to the Atomic Energy Commission our troubles would be over'."

All that first summer Nuclear concentrated its energies on an AEC sale. The four wrote to every man they could think of in AEC describing their facilities for

manufacture and listing machines they could build.

"By September things looked a bit grim," said Schoke. "All our bonds had been cashed long ago. Then one beautiful morning we heard a whoop from Kuranz who was opening the mail. It was a good-sized order from the revered AEC for some electronic equipment they couldn't get anywhere else. Would we like to try our hands at designing and building same? Would we!"

That was what Nuclear's executives refer to as their first "hump." They crossed it with colors flying and before Christmas of 1946 they had a backlog of orders which has increased steadily. However, after orders began to pour in there was the new headache of obtaining materials. Shortages gradually eased and in August, 1947, the company moved to its present location on Chicago's near north side where Nuclear now occupies 14,000 square feet of manufacturing space.

Each of the partners can still perform almost any job in the place—and occasionally does. None of their 65 employees is surprised to find the president or a vice-president working beside him on a rush order.

The first machine sold by the company—an electronic scaler—remains their "bread and butter" instrument. Kuranz describes the scaler as a "basically simple" instrument whose sole purpose is to make recordable the pulses that correspond to radioactivity. These pulses occur so fast that no mechanical means can do the recording and scientists must employ electronic memory circuits to do the job. For every 64 pulses that come into the instrument just one is registered mechanically.

Although Nuclear now has a modern

"Windowless" radiation counter permits samples being tested to be taken directly inside the instrument and detects "soft" radiation of the useful Carbon 14. The Q-gas developed by Nuclear is kept in tank at rear





assembly line and excellent research laboratories, its four founders occasionally resort to ingenious and unorthodox methods and materials for getting results. When it was impossible to secure quartz fibers at a diameter of less than $2/100,000$ inch, Hinspater produced them on what he calls a "mechanical spider." His partners recall their consternation when he walked into the laboratory one day with two bicycle wheels, a bunch of rubber bands, cellulose tape, a $1/10$ -horsepower electric motor, a small lead burning torch, bench plate, a few bolts and other odds and ends. He brushed aside their suggestions that he should take a long restful vacation and instead set to work building his "spider." The torch is used to heat the end of a pure quartz rod into a tiny molten blob. A strand from this blob is carefully "threaded" onto the bars between the bicycle wheels which are slowly turned by the electric motor. The tape is used to hold the first "pulling" of threaded fiber from blob to wheel. This process requires infinite patience and perfect timing. When the fibers are removed from the wheel they are iridescent and almost invisible. Before they are used in instruments the fibers are platinum plated by a special process in a vacuum chamber. They are used in fine instruments to cast a shadow by means of an optical system on scales.

Things are moving so fast in the field of nuclear research and development that several instruments developed by Nuclear

(Continued to page 266)

Nuclear executives (left to right) Schoko, Kuranz, Mitchell and Hinspater hold consultation over minor change in an instrument. Below, portable Geiger counter called Sniffer

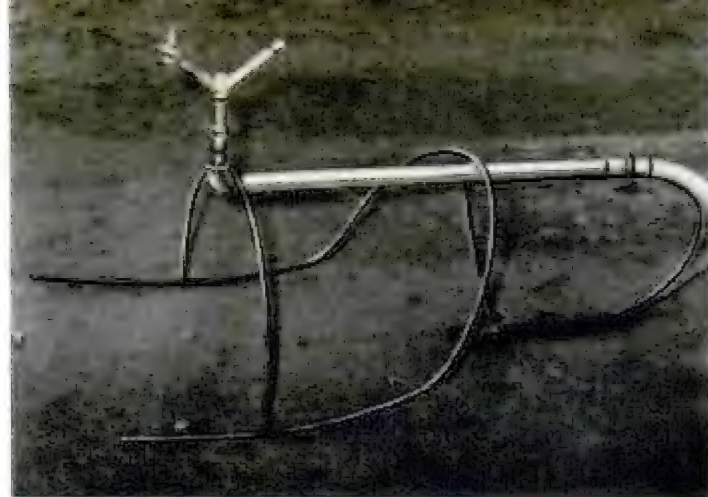




Ludwig couples his 100-foot feeder lines made of garden hose into the fire hose at 50-foot intervals



To move his irrigation system, he drives across the next field and unreels the garden hose. Below, the water area is changed by tugging on the feeder lines



Sprinkler heads are mounted on sled-runner supports so they can be pulled several feet without tipping

Reel-Up Irrigation System

IT'S EASY for W. F. Ludwig, a Washington farmer, to move his irrigation system from one field to another—he just reels it up and takes it with him. By connecting fire and garden hose with water hydrants, Ludwig has worked out a portable irrigation system. He first designed it as a temporary measure but the system works so well he has decided to use it permanently. When he wants to irrigate a portion of his land he runs out a 1650-foot length of fire hose mounted on a reel on his Jeep. Feeder lines made of 100-foot sections of garden hose couple into the fire hose at 50-foot intervals, reaching out into the field to supply 34 sprinkler heads. These sprinklers are mounted on sled runners so they can be pulled several feet to a new location without tipping over. Ludwig moves the water about 30 feet every 12 hours by traveling along the main hose line and tugging on the feeder lines. It takes only 30 minutes to make the change. This method puts water on 10 acres of land with a single setting of the fire hose. After moving the laterals eight times over a period of four days, Ludwig climbs in his Jeep, reels up the fire hose and moves on to another field. He points out that his method has three advantages over a pipe system: low initial cost, sprinklers can be changed many times before moving the main line, and the equipment is easily transported.





Mechanic's Stethoscope

Mechanics, like doctors, now can use stethoscopes to diagnose the troubles of ailing automobiles. A slender probe rod picks up the internal sounds of the engine, body and gearboxes and transmits them to the mechanic's ears through flexible sound tubes, similar to those on a doctor's stethoscope. The instrument is shockproof, so there is no danger in probing while the engine is running.

Spray-On Car Wax

Motorists can spray a new wax on their cars by pressing a button atop the container. The propellant used in the container evaporates upon exposure to the air, leaving nothing but wax on the surface. When the surface appears dusty, it is allowed to dry for about five minutes. Then the dust is wiped off, leaving the coat of wax.



High-Pressure Machine Cleans Inside Engines

Sludge deposits inside automobile engines are dissolved and washed away by a high-pressure detergent spray that cleans crankcases and other internal parts without disassembly. To clean the crankcase, you merely remove the drain plug and insert the pressure nozzle in the opening. Sludge is washed out into the funnel of the return pipe. Valve chambers are cleaned without removal of side plates, simply by taking out one stud and inserting the nozzle. The machine runs on any air compressor that produces 150 pounds pressure and is also used for cleaning air filters, transmissions and differentials.

Arm Locks Wheels for Repairs

Front wheels that are being repaired can be locked in any desired position by an adjustable arm that fastens to the steering wheel. A suction cup holds one end of the arm against the windshield and a clamp holds the steering wheel rigid, preventing the front wheels from moving. The wheels can be turned to a new position by loosening a wing nut, turning the steering wheel and tightening the nut.





Left, Robert Cubitt, "vorpal sword in hand," slays the Jabberwocky. Right, Alice, played by Sylvia Cubitt, watches the Gryphan dance to the very sad song, "Will you walk a little faster?" said a whiting to a snail"

Alice Poses in WONDERLAND

"There was a dispute going on between the executioner, the King and the Queen, who were all talking at once" about how to behead the bodyless Cheshire Cat. The problem was solved when the cat's head vanished in air





Cubitt's wood-carving and photographic hobbies combine as he illustrates Alice's story with slides. Here, he snaps Father William and son in the kitchen. Behind him in silhouette, the Carpenter sheds "a bitter tear"

THERE'S a real live Alice in Wonderland in Rochester, N. Y. She is Sylvia, daughter of an engraver, Michael R. Cubitt, whose twin hobbies, wood carving and photography, have resulted in a beautiful set of slides illustrating the Lewis Carroll masterpiece, "Alice in Wonderland." There are 42 slides in the set and Sylvia plays the role of Alice throughout. She and her brother, Robert, are the only real people in a cast of characters that includes 64 figurines carved by their father.

So skillfully done are the characters and settings that Cubitt has become famous around Rochester for his work and he is having copies of his slides made in response to many requests.

By selecting the most interesting scenes in the well-known children's fantasy, Cubitt has brought the story to vivid and colorful life on his slides. Included among the carvings are four of Father William and four of Father William's son in different poses. He also has made three of the White Rabbit, two each of the Queen of

Hearts, the King, the flamingo and the Gryphon—all in various poses. The Jabberwocky, of "Through the Looking Glass," is another and, of course, the Mad Hatter, the March Hare and the Dormouse could not be left out.

The majority of Cubitt's characters are carved from wood, but the lobsters appearing in his scenes are real crawfish caught in the creek behind his home and his life-size flamingo is made of papier-mache. The figurines average six inches in height, except for the foot-high Jabberwocky.

Cubitt uses oil paints, plastics, metallics and cloth materials to dress his characters in suitable finery. He painted the Queen of Hearts and added paper hearts for additional decoration. She also wears a child's locket and a diamond crown, both of which he found in a 10-cent store.

When looking around for props to complete his settings, Cubitt discovered that white plastic thimbles were just the right size to make teacups for the Mad Tea Party. Buttons serve as plates and saucers. The



Left, Cubitt does some touching up on the Queen and her flamingo. The finished slide is shown at the right

lawn is a strip of green carpeting. Evergreen trees are simply sponges trimmed and tinted green.

Cubitt's daughter, Sylvia, playing the role of Alice, was photographed in 20 different positions in front of a black background. When the story-telling slides were made, he added her figure to the scenes by projecting the image on a screen and double-exposing the projected image and the set to form one composite slide. In a few cases, he had to triple-expose his film

to achieve the exact effects he desired.

The camera Cubitt uses is a combination of a Kodak Bantam and a $3\frac{1}{4}$ by $4\frac{1}{4}$ double-extension camera with a color-slide adapter back. The Kodachrome slides are 2 by 2 inches for use with a home projector. Since he conceived the idea four years ago, Cubitt's production of this illustrated story of Alice has been his recreation. Alice is as familiar around the Cubitt home as if Sylvia were the little girl who inspired Lewis Carroll's masterpiece years ago.

Drinking tea with March Hare, Dormouse and Mad Hatter, Alice is puzzled by the watch that is two days slow





Extra Rear Wheels Make Bicycles Safe

Bicycles are made as safe as tricycles for small children when a pair of extra wheels is fastened to the rear hub to keep the bike upright at all times. A bent steel rod goes up over the rear wheel, serving as both axle and bracket for the extra wheels, which can be raised off the ground when not needed. With the small wheels in a lowered position, any bike becomes as stable as a tricycle. The wheels can be raised slightly off the ground to teach youngsters how to balance on two wheels. Should they lose their balance, the extra wheels prevent them from falling.



Sealed-Beam Lamp Triples Bike Light

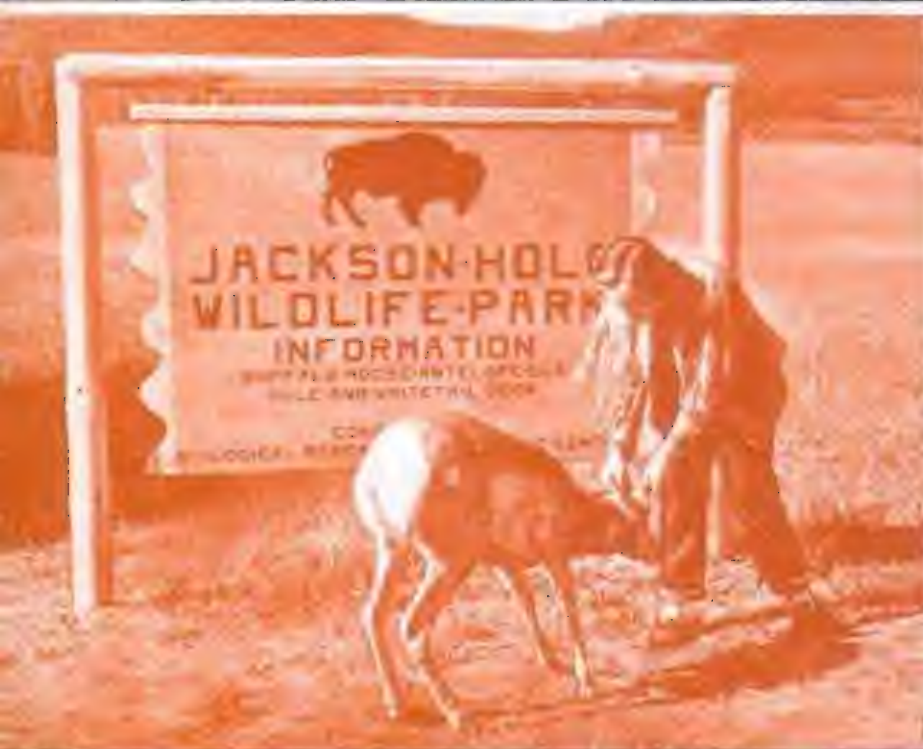
After-dark cycling will be safer with a new sealed-beam bicycle headlamp developed by General Electric engineers. It is a small edition of the type now used on automobiles. The volume of light cast is three times greater than that thrown by present bicycle headlamps, which put little more than a spot of light on the road ahead. The lamp can be mounted either on the handle bars or atop the front fender.

Folding Motor Bike for "In Between" Transportation

Only a few seconds are needed to unfold and start a collapsible motor scooter that fits in a space 14 by 18½ by 23½ inches. Designed for airfield or dock-to-town

transportation for flyers and boating enthusiasts, the steel-framed scooter travels 20 miles an hour and will go 100 miles on a gallon of gasoline.





Herds of elk in the large meadows of Jackson-Hole Wildlife Park in Wyoming are a delight to visitors. Fences are "invisible"

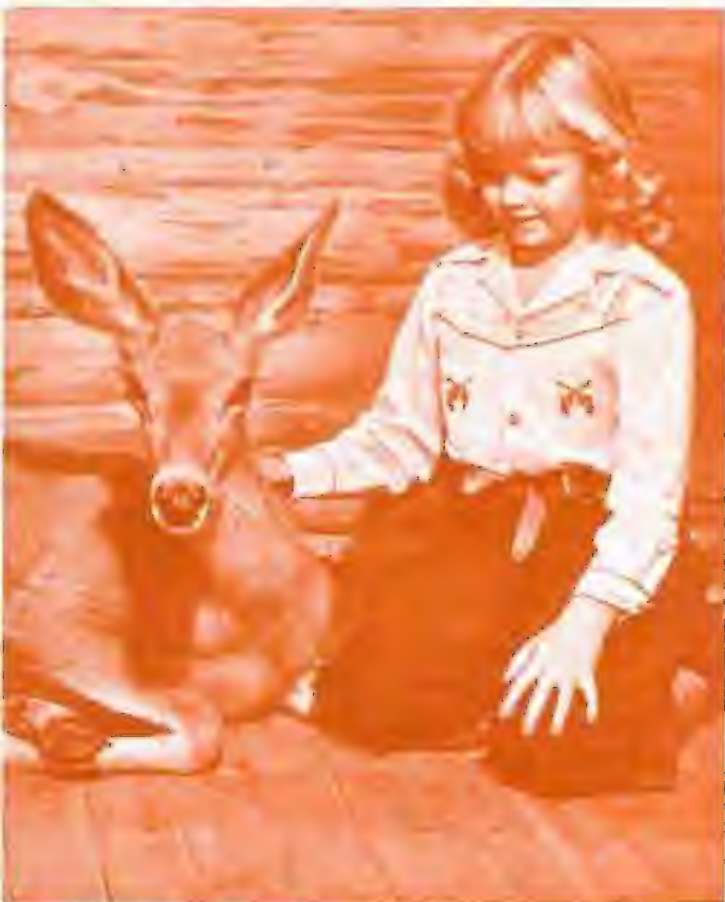
Left, many of the animals in the park are not afraid of people and this antelope is proving it by playing with young tourist

Team and sled carry hay to buffalo after heavy winter snow while an antelope tags along. The winter menu: 110 tons of hay



Big game "at home" to visitors

By Tom McHugh



AMERICA'S first natural wildlife park was recently opened to the public near Moran, Wyo. The Jackson-Hole Wildlife Park, as it is called, has earned this distinction by displaying big game in a vast, apparently unfenced area.

An "invisible fence" is the unusual device used by the park to enclose more than 100 big-game animals. The fence has been so well camouflaged that it remains almost completely hidden. This was accomplished by concealing it in wooded areas or behind hills.

Buffalo, antelope, elk, moose and deer can be seen by the motorist as he drives through the park amidst herds of these creatures. The beasts seem to be little bothered by their intruders and carry on as if they had complete freedom. Last summer they produced more than 20 young in the park.

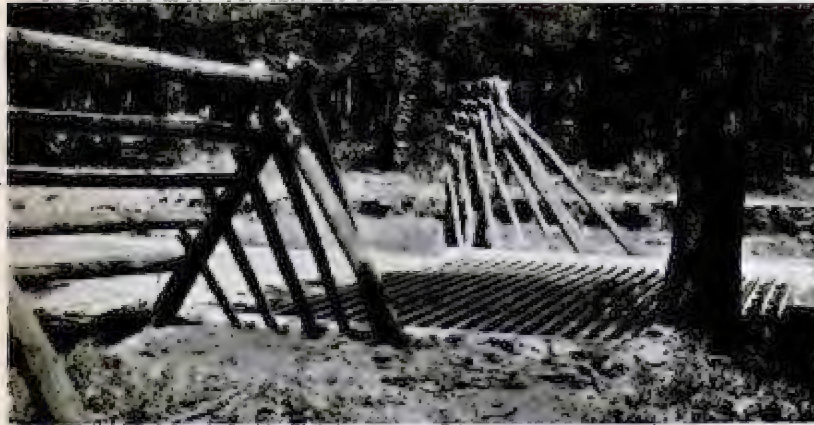
Capturing such an array of big game created quite a problem for the Wyoming

Left, one of the park's tame mule deer spends his spare time in the information booth where he enjoys attention. Below, the so-called "invisible" fence is concealed behind wooded area or the hills





This is one of many homeless fawns given to the park to be raised. This one takes his vitamins by bottle



Gates are always open because the animals refuse to walk across gaping railroad rails over small pit

Game and Fish Commission, one of the sponsors of the park. Their game wardens used a different method to catch alive and without injury each of the types of animals.

Antelope, with a speed of almost 55 miles an hour, were the most difficult quarry. Since they typically dwell on vast open plains, they can seldom be cornered. Game men solved the puzzle by erecting a large funnel-shaped trap. It was constructed of fish netting so that these fast but fragile beasts would not be injured. A pocket at the end of the funnel held the animals until they were loaded into crates.

Airplanes were then used to discover herds of antelope. Once located, the herds were driven into the trap by careful maneuvering of the planes.

Elk were captured as they migrated past the wildlife park on their way to winter feed grounds in southern Jackson Hole. The park gates were opened until enough elk had wandered in. Closing the gates trapped the unsuspecting animals.

Moose are the only animals that can jump over the seven-foot fence surrounding the wildlife park. Since ponds inside the park are so attractive to moose, a few of these large antlered animals can always be seen.

With such a wealth of wildlife as a background, the Jackson-Hole Wildlife Park has also launched a biological field station that will search the Rocky Mountain area for new facts about our wildlife. Thus, the park is serving conservation both by displaying wildlife to the public and by uncovering new data to aid in wildlife preservation.

Gathered around the hay shed are two helpers, antelope, deer, moose and four of park's prize buffalo





Auto-Wheel Balancer

Any motorist or filling-station attendant can balance automobile wheels with a new bubble-level tool. The user places the balancer on the floor, chooses the proper ring to fit the size of the wheel and places the



ring over a spring in the tool. He then lowers the wheel into place. The weight compresses the spring and the side of the wheel that is too heavy drops below horizontal, as indicated by the bubble level. Weights then are installed on the opposite side to balance the wheel.



Fibreglass Assault Boat

Made of glass and plastic, an experimental assault boat is undergoing Army tests at Fort Belvoir, Va. The boat's plastic hull is reinforced with Fibreglas. It weighs

300 pounds and carries 15 men with their equipment. A plywood assault boat used during the war weighed 410 pounds and carried 12 men. Power for the experimental craft is provided by a 33-horsepower outboard motor.



Color Magic

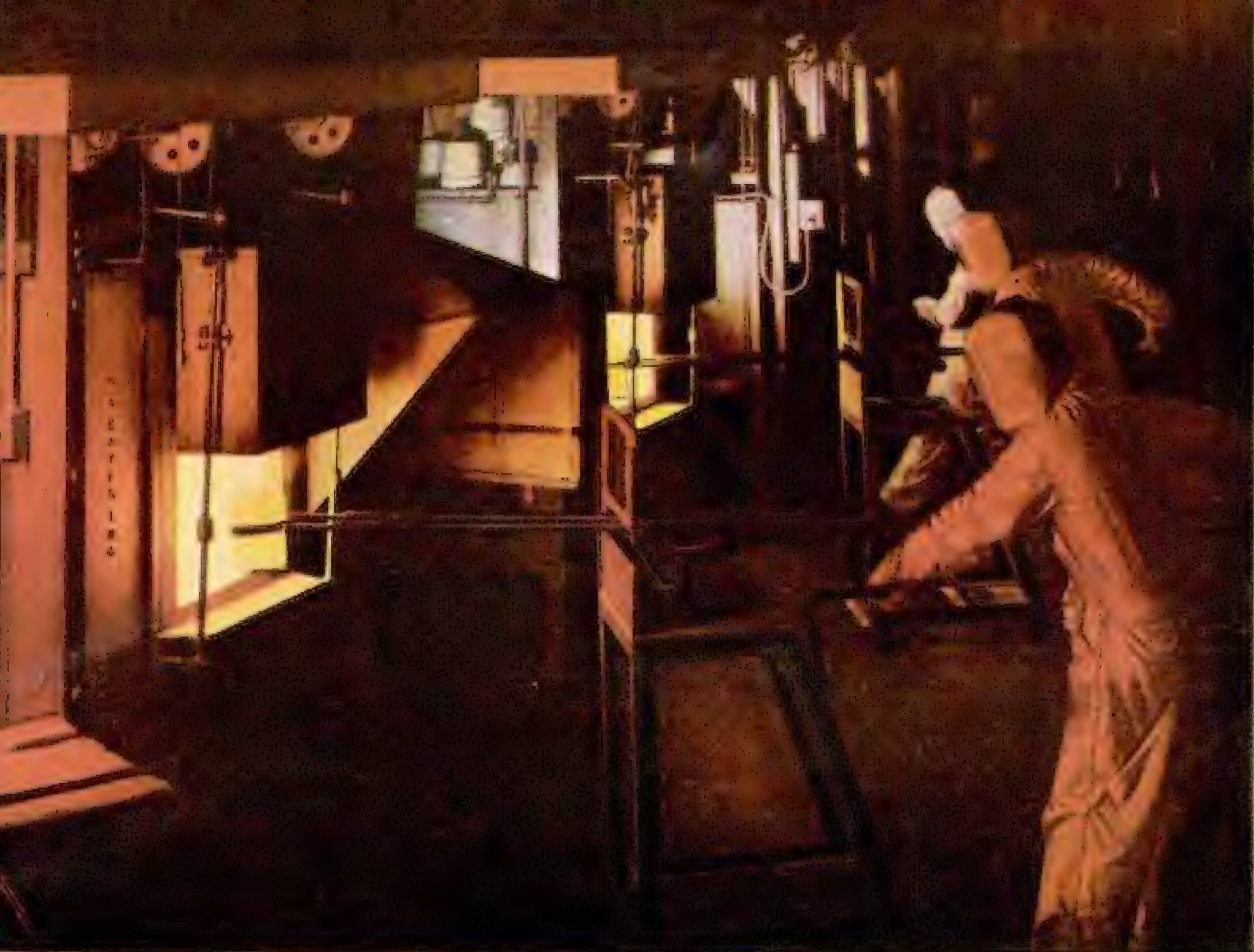
1. This is the first step in preparing a Kodak Flexichrome print for coloring. A print is made on Flexichrome film and after the film is bleached the image is dyed with a special modeling agent

2. After a warm bath the emulsion on the film is stripped from the film base. (These prints can be made from ordinary black-and-white negatives in any regular projector or any contact printer)

3. Here the emulsion from the film base is transferred to a sheet of photographic paper which has been thoroughly fixed and washed. (If a transparency is wanted, the gelatin is put on a clear glass)

4. Using a transparent transfer sheet to protect the emulsion, a squeegee is used to assure firm contact between the emulsion from film and the photo paper to which it has been transferred

5. When the print is hung up to dry, the transfer sheet is stripped from the photo. After drying, the print is ready for color. These photos show only the most important steps in the new process



This Flexichrome color picture was made from a black and white taken in lighting unfavorable for color photo

From Black and White

By Richard F. Dempewolff

EVERYONE in the studio was in a sweat. The big New York advertising photographer hunched behind his color camera muttering darkly. The model, wearing a jaunty Easter bonnet dripping with plastic berries for a magazine cover, looked grim. Perspiration glistened over her upper lip again from the batteries of close, hot lamps. All day they'd been stopping, mopping, applying fresh make-up, trying again. Waste-baskets spewed dead flash bulbs across the studio floor.

Everything was ready for the last weary shot to complete the three perfect exposures needed in the elaborate color-print process. Then it happened. The sprightly berries gave up the fight and melted.

Photographer Jack Crawford slammed his cloth on the floor, his hat on his head and stalked out. A \$50 Easter hat ruined! A \$100 model fee down the sewer! Reams of special color film, 200 flash bulbs and

a whole studio day shot to blazes! What's more, he'd probably lose his client.

He did. But that's what started Jack Crawford thinking after that black day in 1932. And the thinking congealed into an idea.

Today, Crawford's idea is the hottest news in professional color photography. What he dreamed up out of his frustration, probably is the most flexible color-print process ever devised. All the professional photographer needs is a single black-and-white exposure, taken with usual lighting in the usual way. In a few hours he can wind up with a print in gorgeous full color. Small flaws can be covered. And if the cameraman or his ornery client doesn't like the shade of the backdrop, the make-up, or the color of a rose, it can be switched or toned with ridiculous ease. This can be accomplished on any part of the picture and any number of times. The process is



The pictures across the top of this page show how a black-and-white print is transformed into a full-color picture which only an expert could tell from a genuine color photo. The first picture above is a Flexichrome black-dyed relief print. The center picture shows how color mixed with a weak solution of acetic acid is applied to a local area. The third picture shows how the other local areas are colored

Robert Korta, Popular Mechanics artist, at work on the background of photo shown at top of next page



so flexible that the Eastman Company, in whose laboratories Crawford's process was finally perfected for marketing, calls it "Flexichrome."

Basic principle of Flexichrome lies in the use of color dyes—not paint—on a special kind of black-and-white print. The print automatically takes the dye and automatically shades itself, so the person applying the brush need be no artist.

A curious thing about the dyes is that they replace each other. Anyone knows that if you put blue paint on yellow, the result is green. But on a Flexichrome print you'll get blue. The last dye applied washes the first one out of the gelatin. Smear enough black dye all over a finished Flexichrome print and, instead of a horrible mess, you'll wind up with a black-and-white print again.

Among the beauties of the process is that subjects, which for technical reasons could never be photographed well in color before, can now be color pictures. High-speed action, for instance—racing cars, Ted Williams whipping one over the fence, President Truman pitching a horseshoe, jet planes stopped in mid-air—anything possible in black and white but very difficult in color. They can be opaque or transparent. They can be done in one color, two colors or full color at will. In short, pick your flavor.

Making a Flexichrome color print begins with preparation of the special black-and-white print. This can be made from an ordinary black-and-white negative, in any ordinary darkroom projector or contact printer.

Instead of printing on paper, the photographer prints through the back of a special



"relief stripping film," timing his exposure about the same as he would for bromide paper. He can "dodge" or control his light as he would in making any enlargement.

The exposed film is then developed in a special developer containing a tanning agent. The tanner acts on the highly exposed, or darker, portions of the picture in such a way as to harden them and make the gelatin surface of the film swell up in those spots. The lighter, or less exposed areas, are less affected by the tanner and the gelatin remains soft and soluble.

After developing, this soft gelatin is washed away by rinsing the film in a hot-water bath.

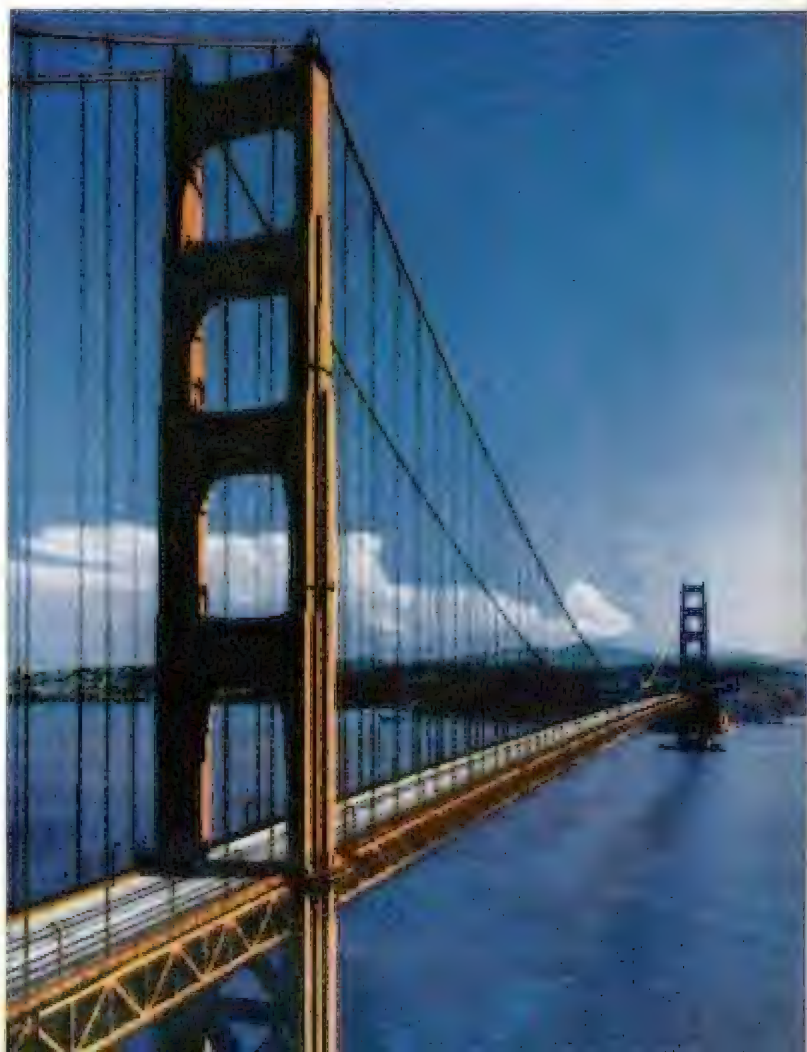
When the film is pulled from the hot water, it is no longer a flat-surface print. Instead, if you cut out a slice and magnified a cross section a hundred or so times, it would look like a relief map; the mountains represented by dark areas, the valleys by lighter areas. Actually, the picture has become a bas-relief, chemically carved into the gelatin surface on the film.

The film print is now run through a bleach. This removes the silver, which gives any print its visible black-and-white appearance. What comes out of the bleach is enough to give any uninitiated photographer the shuddering horrors. It looks like a sheet of window glass—barely a trace of a picture anywhere to be seen. But it's there, all right, permanently carved in the transparent gelatin. If you don't believe it, the next step proves it, for the film is now immersed in black Flexichrome dye.

Since the highlights are the valleys, they do not absorb much dye. There isn't enough gelatin to retain the particles of color. So they stay light. The thicker

The fourth photo in the panel shows almost a finished effect but note the difference after a heavy wash (center) has been added to the background to deepen the hue and the face has been worked over for a more natural coloring. The final print at right is dipped in lacquer and hung up ready to dry. At any time in process excess color is removed by blotting surface. Repeated applications of color determine intensity

Kodachrome or Flexichrome? Picture of Golden Gate bridge is Flexichrome color made from special print





Color film captures only what the camera sees; with Flexichrome, the advertising artist can vary background

gelatin layers soak up the dye, however, and get blacker and blacker according to their varying thicknesses. In a few minutes, the picture is as plain as it was before the bleach—only now it's dye and not silver that makes the image visible.

The picture still is on a film, and therefore transparent. It must be put on an opaque background to make a color print. So, once more it goes into warm water until the thin gelatin surface is loosened from its film backing. The gelatin layer is then stripped off and transferred to its final white paper backing—which may be standard photo paper with any surface texture desired. If the photographer wants a transparency instead of a print, he simply transfers the gelatin to clear glass or good clear film instead of paper.

When the paper mount dries, the photographer has his basic Flexichrome print, ready for coloring. Perhaps it sounds involved, trailing itself out in words. Actually, from enlarger to drying rack is a matter of about 15 minutes.

Technique for painting a Flexichrome print can be summed up in four steps: 1. Take a color and smear it over the print with a water-color-type brush; 2. Blot up

the mess; 3. Rinse with two percent acetic acid; 4. Blot. The result is startling, to say the least. Every place where the color contacted the print, it has become a delicately shaded tone through no fault of the painter. And it has replaced the black dye, which was simply applied as a "modeling agent" so the photographer could see where he was putting his color.

As the colors are applied, they become an integral part of the picture, preserving the photographic definition of the image. Shadows are not black, as in water-colored prints, but a dark, dark shade of whatever color they should be. In a forest scene, for instance, the shadows will become a dark green in whatever shade is applied, replacing all of the black modeling agent. Where does the black go? Up in the blotter. It may take several applications in very dark shadows, but eventually after painting and blotting repeatedly, the green wins.

It is the repeated application of a color to any area that determines its intensity. The first dose usually results in a pale tone. And what if you smeared pink over an area that should be blue? Nothing to worry about, of course. The blue will gradually

(Continued to page 254)



SELF-PROPELLED AQUAPLANE

Motorized aquaplanes, skimming along at 30 miles an hour, provide all the thrills of water skiing and aquaplaning without the expense of a speedboat. Called a Skim Boat, the water toboggan has a 7½-horsepower outboard motor in a watertight hull forward. The propeller is located under the bow. The fast-turning craft is steered by a combination of weight shifting and rudder movement. To prevent the boat from running away, an automatic shutoff stops the motor should the rider fall off





Twin tubes present two different images. The stereoscope viewer produces the three-dimensional effect



Electrodes on patient produce three-dimension electrocardiograph. Diagram below shows stereoscope effect

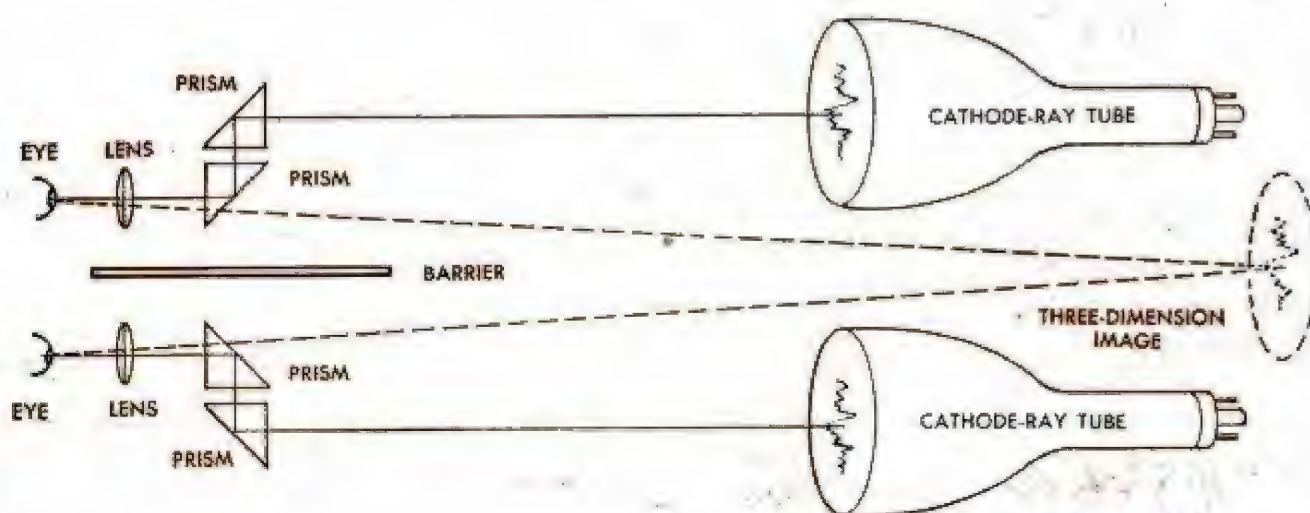
RADAR in three dimensions

IN A CLUTTERED laboratory room at the University of Minnesota there's an instrument that can present radar or television in three dimensions. But that's only the beginning — the instrument also can rotate these pictures in any direction. The observer can produce the effect of walking around the object, climbing up over it, crawling under it or plunging into it.

The implications of the instrument are big. For example, with the instrument coupled to radar, the observer could tell whether two planes are on a collision course. Or, if a group of planes is picked up on the radar screen, the observer can go around, above or under them to discover their exact flight pattern.

The instrument is the work of Prof. Otto H. Schmitt of the university's biophysics department, who has adapted the principle of Grandma's old-fashioned stereoscope to two cathode-ray tubes. To the tubes he has coupled a series of resistors and potentiometers. When he feeds electronic information into the instrument, it paints a picture on each of the tubes. But the two pictures are slightly different. A composite of both pictures produces a sense of depth. Professor Schmitt's instrument shows one of the pictures to one eye and the other to the other eye. Thus the instrument fools the observer into believing he is viewing a single three-dimensional object.

For such a wizard as Professor Schmitt,



it is relatively easy to enlarge or reduce the picture so that the observer seems to be approaching or walking away from it. Naturally, this also means that the slight difference in the two pictures must be varied accordingly.

By turning azimuth or elevation knobs, Professor Schmitt changes the electrical data going into the tubes and the picture rotates vertically or horizontally.

Professor Schmitt started devising the instrument when he wanted to solve mathematical problems involving three variables. To get the answers he had to draw a series of three-dimensional mathematical pictures. The problem could be solved but required a great deal of time. He decided that the ideal method would be to draw, somehow, a mathematical picture and then rotate it at will. About this time he sensed that a possible answer might be to utilize a combination of Grandma's stereoscope, two cathode-ray tubes and the electronic instruments that could convert measurements into geometric forms.

The physicist is more interested in the instrument as a tool of mathematics than as a development in radar or television. Scientists engaged in heart-disease research are excited about the results he has obtained by connecting the instrument with an electrocardiograph. The throbbing voltage of the heart has been measured for years as a means of detecting heart ailments. Electric leads are strapped to the patient to check the voltages. Heretofore it has been possible only to see three voltages as three separate pictures. Now Professor Schmitt, using six electrodes, can show the entire heart action as a three-dimensional picture which can be rotated for examination.

On upper screens are three variables. Lower screens combine information into slightly different pictures



Twin Fruit-Picking "Baskets"

Twin containers that fit against the hips add safety and speed to fruit picking, replacing the old familiar bucket. Often it is difficult for the picker to grasp the tree and a conventional bucket and still keep one hand free to pick the fruit. The two hip-fitting containers are held by a shoulder and waist harness. The containers are made of sheet aluminum with canvas sides next to the body and canvas drop bottoms which fold down, allowing the fruit to roll gently into the boxes. Fruit is measured during the picking because two of the containers fill one fruit crate.

Fluorine Released In Air Hazard to Livestock

Fluorine, released in the air by industrial plants, damages crops, poisons livestock and etches glass windows, but it does no lasting damage to the soil. These facts were reported by a University of Tennessee professor who studied the effects of fluorine released in the air by large aluminum plants in Tennessee. Two of the richest food-producing counties in that state have been rendered unfit for profitable livestock and dairy farming by the highly corrosive fluorine compounds. When absorbed by the soil, fluorine has little effect on growing crops, but when present in the air it does render grass and hay toxic to animals.

☛ American manufacturers produce about 500,000 fishhooks each day, and about 50 percent of them reach amateur anglers.



Two-Section Boat Is Its Own Trailer

At home on land or water, a two-section boat has a retractable carriage that lowers automatically when the boat is folded for land travel. An Arizona sportsman, weary of the inconveniences of boat trailers and car-top carriers, built the boat to his own design. The hinged stern section swings up to rest on the bow, shortening the boat for towing and, by lever action of the undercarriage, lowering the two wheels to the ground. When the boat is opened out, the two sections are locked into a solid unit by pins inserted in two hinges near the water line. Bulkheads make each section a watertight unit that would float alone. The wheels ride above the gunwales when the boat is afloat. The trailer hitch is attached permanently to the bow.

Typewriter Feeder

Typing production is increased by a device that automatically feeds business forms and carbon inserts into typewriters and billing machines. The typist presses a button and the machine drops a complete set of forms in place, aligned and in register for instant use. A full day's work can be stacked into the feeding compartment at one time. It handles forms of from 2 to 20 parts, up to 9 inches in width and 14 $\frac{3}{4}$ inches long.



Rats Grow to Giant Size In Hormone Experiment

Giant rats, old by normal standards but still possessing the characteristics of youth, have been produced in experiments with the growth hormone. Although the rats live to extreme old age, they continue to grow throughout their lifetimes and average almost twice as much in weight as normal rats. Their organs vary in size, some keeping pace with their body growth, others remaining normal, while

still others are slightly reduced in size. The experiments, conducted at the University of California, suggest that there is no substance in the body which can check the growth hormone.

Hydra-Matic Drive Featured on '50 Nash

Three transmissions—Hydra-Matic, automatic overdrive, and standard—are available in the 1950 Nash. Hydra-Matic Drive is a new feature for Nash, as is overdrive, and is optional on the Ambassador. Overdrive is optional on all models. Another addition to the Ambassadors with Hydra-Matic is a new starter control, actuated by lifting the direction control lever. A new member of the Nash family, the Statesman, is replacing the 600 series. The 1950 Ambassadors are powered by high-compression 6-cylinder overhead-valve engines developing 112 hp., a motor which has been designed to operate with a high degree of efficiency using regular gasoline. The Nash Airflyte Statesman is powered by an L-head type, 6-cylinder engine. Nash again offers full-length twin beds, and a new reclining front right seat with five positions. The rear window is much wider and the bumper guards are enlarged.



The 1950 Nash offers greater visibility than any previous model. A new feature of the Nash "bed" is a reclining front seat with five positions

Amphibious Helicopter Has Wheels and Floats

With floats for water and wheels for land, the Sikorsky H-5H becomes the world's first amphibious helicopter. The new combined gear cancels out the disadvantages each has when used solely and independently. Floats permit water landings, but present problems in power-off landings ashore. Without wheels, handling for maintenance work and storage is more difficult. Another change in the H-5H, used by the U. S. Air Force for search and rescue missions, is the relocation of its three litter compartments. In the new version, they run from side to side, two in the front cabin and one at the rear of the engine. A hydraulic hoist is permanently installed.



Sikorsky Aircraft photo



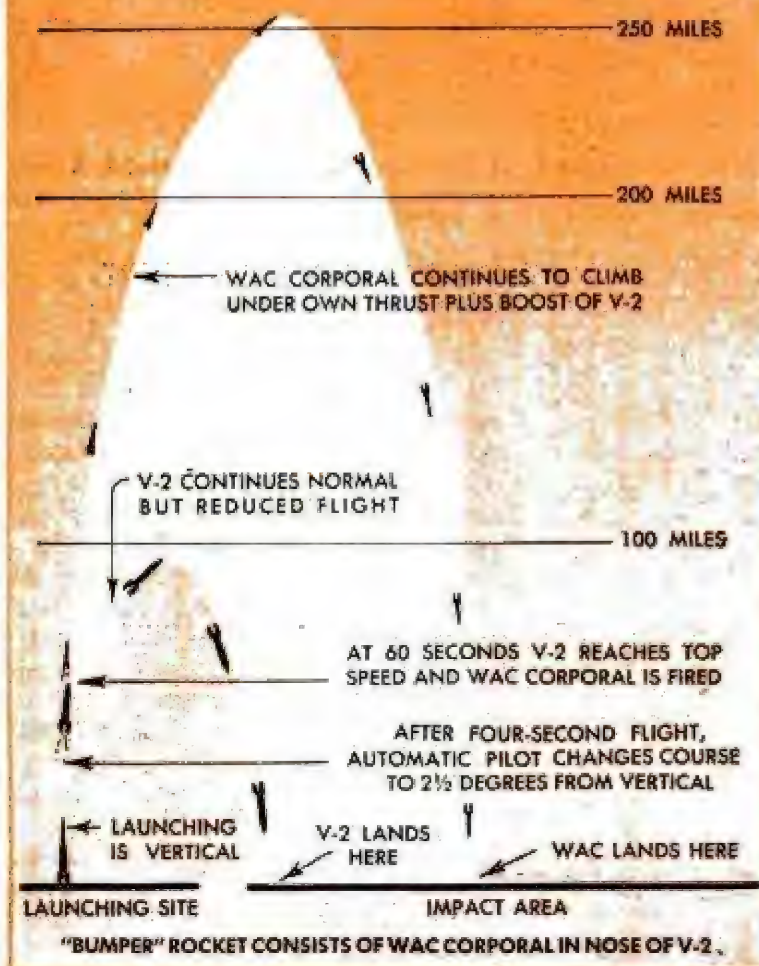
They pilot sky-piercing rockets

By Thomas E. Stimson, Jr.

ANOTHER "Bumper" was on its way! Driven by its roaring jet, the great two-stage rocket rose from the desert floor.

The take-off was slow but due to its tremendous acceleration the rocket was traveling 3600 miles per hour within 60 seconds. By then it was 20 miles up and at that point the ground observers could see, through their telescopes, the little "Wac Corporal" break away from the nose of the larger rocket. Spewing its own jet of flame, it gradually climbed

Although the rocket won't land for another five minutes, this instrument, an impact-point predictor, has determined exactly where it will land. Below, diagram shows how the "Bumper" is soaring to new heights. Below, right, recently the Air Force has been firing rockets which contain parachutes. Chute eases the instrument section to the ground



away from the still-ascending V-2 rocket.

At that instant, at South Station three miles from the launching site, a pen that was moving across a paper chart came to an abrupt stop. The men who had been standing in tense attitudes around the instrument relaxed in smiles and one of them pointed to the pen. "That's where the V-2 will land, in about five minutes," he said. "Well inside the range and safe."

The impact-point predictor is an ingenious device into which speed, acceleration and angle of climb information are fed. In turn, it answers the question: "Where will the rocket land if its power is cut off at this instant?" The predictor makes the calculations and moves its traveling pen to the right location. It draws a continuous line on a piece of paper upon which the confines of the rocket range are marked. When the rocket motor is cut off, the pen stops and the technicians need only a glance to see where the missile will land.

Meanwhile, on automatic plotting boards alongside the predictor, other pens were creeping across their papers, translating radar impulses from the rockets into lines that showed altitudes and courses. The

Below, tracker sights up sky screen as rocket is fired. If missile doesn't climb within wires, its motor is cut so it will land within the range. Right, the Bumper rises pompously from its launching site





Motor is operated at reduced thrust for moment before take-off while all parts are checked. Below, Karsch checks course on radar plotter while assistant stands by, ready to blow up rocket if necessary



Inside telemetering trailer a movie camera records instrument readings from rocket during its flight

V-2 pens stopped just six minutes after the take-off. That rocket had landed, and the pens showed that it had hit the earth at the exact spot that had been forecast by the impact-point predictor.

The Wac Corporal pens were still moving and they would continue to trace their lines for another eight minutes or so. During that time the missile would attain an altitude of 250 miles and then would plunge back down through the atmosphere again. According to calculations, it would land inside an impact area that measured about 40 miles on a side.

When the Army's Ordnance Department fires a high-climbing rocket at its White Sands Proving Grounds in New Mexico, much more than the half-million dollars that the rocket may have cost plus months of work are at stake. If anything goes wrong, the missile may not fly true. Conceivably, it could fall in a built-up area. By impact alone, without explosives, it could do considerable damage.

To prevent any such calamity the rocket technicians have invented an elaborate system of safeguards. The rocket motor can be shut off by radio before its prearranged burn-out time, reducing the distance that the rocket will travel. The rocket can be blown to pieces in flight,



somewhat reducing the impact force when it lands.

The responsibility of keeping the rockets within bounds rests on Herbert L. Karsch, civilian safety officer. At his headquarters at South Station he is the focal point of a complex radio and visual tracking network. At the South Station headquarters, at Hueco Station 22 miles south of the launching site and at West Station six miles to the west of the launching site, men sit behind sky screens that consist of three wires stretched in front of them on large frames. The center wire marks the path that the rocket should follow, as viewed from that location, and the others mark the maximum deviations that are permissible. If all goes well, the observer merely reports "The rocket is climbing right up the wire!" If it deviates from its intended course, the observer reports the fact at once, for every second counts if the rocket's course is to be altered.

The sky screens are backed up by other optical devices such as telescopes that track in elevation only and that contain in their fields a number of parallel vertical lines. The rate at which the rocket crosses the lines indicates its lateral velocity and whether or not it is on course.

Trailer, festooned with antennas, monitors signals to and from rocket. Below, diagram shows how rocket is controlled in case it deviates from its course





Optical trackers pick up the rocket and follow it during the powered portion of the flight. Below, no explosive made this deep crater. V-2 warhead, minus TNT, plowed deep into ground



At South Station, in addition, is the radar tracking equipment. This actuates a transmitter that is installed on the rocket and causes it to radiate signals to the ground. These are decoded by electronic devices into velocity, altitude and direction, and are automatically transcribed onto the plotting boards. Radar is more accurate than the optical tracking devices; the optical methods serve simply as a stand-by in case the radar happens to fail.

When word arrives that a missile is about to be launched, Karsch puts on earphones to which radio or phone circuits from all three safety stations are connected, and hovers over the impact-point predictor or one of the nearby automatic plotting boards.

Beside him stands a companion who holds in his hands a switch box that is connected by means of five audio-tone radio channels to radio receivers on the missile. If he pulls the switch one way, three channels are affected that close the rocket's steam valves, shutting off its fuel supply. If he moves the switch in the other direction, signals are sent out that blow up eight $\frac{1}{2}$ -pound blocks of TNT that are attached just behind the warhead. These explosions separate the warhead from the airframe.

Karsch has less than 60 seconds in which to make his decisions aft-

"Cannon ball" now under development will be ejected to check upper-air temperatures



er the rocket leaves the ground. He can do little to alter its flight after the normal burn-out period. Normally, the missile flies true and the radio reports that come in from the outlying safety stations merely confirm the evidence on the plotting boards in front of him.

But if the rocket starts going bad, possibly 30 seconds after take-off, Karsch must think and act fast. His first duty is to prevent the missile from landing outside the range. At the same time he must allow it to attain the maximum altitude that can be reached with safety. Each rocket is a research vehicle, packed with instruments, and the whole rocket program might be retarded if it is brought down too soon.

"We talk it around by radio," Karsch says. "and if it is apparent that the rocket is headed off the range, we chop the motor at 40 or 50 seconds, depending on the rocket's lateral velocity. With its thrust cut off, the rocket climbs to a reduced altitude and then falls back to earth, inside the range.

(Continued to page 260)



Spiral antenna is aimed at the missile throughout the flight. It receives telemetering signals which are recorded to give information about the flight. Below, here's just part of the radar equipment used to track the rocket, control its flight and receive signals from the missile's radios





Stern view of Gar Wood's Venturi shows huge "wind tunnel" between twin hulls. Air in tunnel cushions ship

THE SHIP THAT RIDES

Gar Wood on deck of Venturi operates remote-control electronic unit which changes pitch of propellers to reverse ship when docking. Engines have no reverse



FROM AROUND a point of palm-fringed Fisher Island, off the south end of Miami Beach one day last August, came two deep-bellied toots, ushering in what may well mark the start of a brand new era in ship design. They were followed immediately by the monster they announced—a weird 188-foot craft that slid into Biscayne Bay like some giant ferryboat on stilts. No ferryboat ever behaved like this, however.

Two catamaran-type hulls knifed the waves like paper-thin steel blades at a cool 30-mile-per-hour clip, leaving a wake so flat it could barely be seen. Despite a sharp 90-degree turn it was making, its flat aircraft-carrierlike deck was almost parallel with the distant Miami horizon, showing no heel at all.

Long thin hulls thrust forward through the air to bridge the wave crests, sending the strange craft skimming over the sea like a monstrous sled. There was no pitch, roll or up and down motion to this floating "wind tunnel," for she was equipped with built-in knee action. Her shock absorber was a column of air, rushing through the Venturi-shaped passage between her hulls, which squeezed the breeze and made it



Cruising at 26 knots, Venturi's twin hulls draw six inches of water at the bow and four feet at the stern

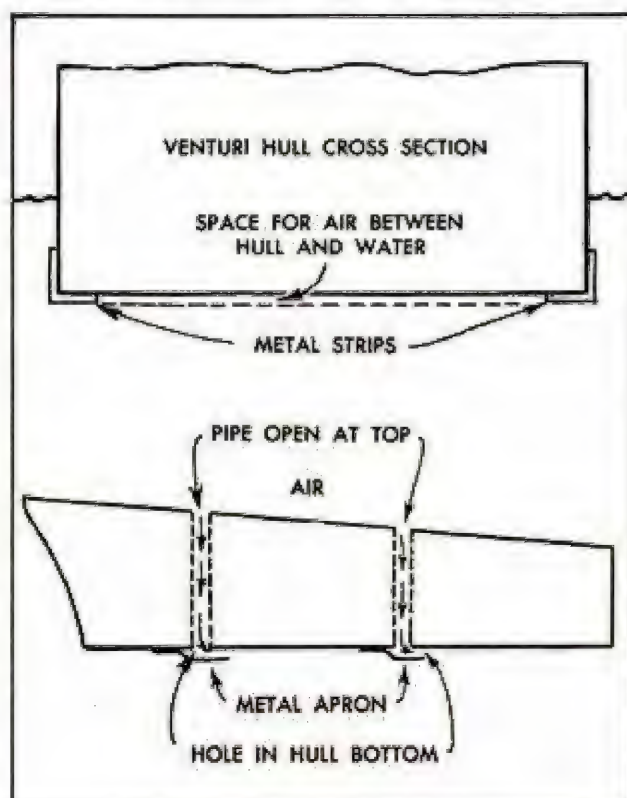
By
Richard F. Dempewolff

buoy up the 120-ton ship. She was, in fact, riding more on air than water.

From this wind tunnel the ship derives her name—Venturi. She is the culmination of 28 years of experimentation by her inventor, Garfield A. (Gar) Wood, international dean of motorboat racing.

Today, the fantastic result of all those experiments is going through tests in the Gulf Stream and proving the Venturi as good if not better than Wood's wildest expectations. Cruising at 26 knots, her twin hulls draw only six inches of water at the bow and four feet at the stern—practically nothing for a ship so big, and a vital factor in cutting that speed and power killer, "skin friction." Tank tests conducted by the wiry, white-haired inventor already indicate that bigger ships in the Venturi pattern can revolutionize aircraft carriers, providing pilots with a flight deck that will stay put even in heavy seas. Ocean liners of Venturi design would be palaces of comfort. A 16,000-ton vessel, for instance, could provide roomy accommodations in unlimited tiers of decks above the roof of the odd Venturi tunnel—enough, in fact, to carry 4000 passengers, with all the stability and comfort

Diagram shows how Wood plans to introduce air under the flat-bottom Venturi hulls to reduce friction





In these three photos, Gar Wood shows the basic principle of his Venturi-type construction which is designed to prevent rolling and pitching. With model above he shows how easily ordinary hull tips



Here Wood has split the boat hull lengthwise and reversed the two halves, placing the curves on the inside. Outside curves cause yawing. Below, he has bridged the split hulls to make them stand up



of a Waldorf-Astoria Hotel, and at a speed of more than 40 knots. What's more, its engines would have to deliver only 120,000 horsepower to do the job! Compare this with the mighty Queens, which carry 2000 passengers, weigh almost 90,000 tons and need 200,000 horsepower to drive them through the seas at 32 knots. Reason?

"These ships," Wood explains, "have massive hulls that crash and plow along, digging great holes in the water ahead of themselves, and then pulling the hole shut astern. Think of all the wasted power required just to climb waves and push aside thousands of tons of water. With the Venturi, the faster she goes, the farther out of the water she is pulled by air rushing through her airfoil tunnel, and the less resistance and friction she gets from the water."

Germ of the Venturi idea was born in 1921, after Gar Wood had captured the coveted Harmsworth trophy in the first of his 10 famous Miss America speedboats, hitting the then incredible speed of 61.51 miles an hour. (Later, he more than doubled it.)

To achieve such super speeds, the inventor was always fooling with unconventional ideas. Typical was the time when, as a kid racing standard boats on the Great Lakes, he put his fuel in a common oilcan, inverted it over the air intake, and roared away from his astonished rivals with a burst of unexpected speed. Without knowing it, he'd invented down-draft carburetion.

Similarly, he experimented with hull design to lick water-resistance problems, and out of it came the Venturi.

"Yawing" has always been a headache to yachtsmen. This phenomenon, in which the bow shifts back and forth at its own whim, requires constant attention from the helmsman who must correct each shift, and is a dangerous thing at high speed. Wood figured it was caused by the curves



As 188-foot Venturi cuts through the waves the wind rushes through tunnel. Outer sides of hulls are straight

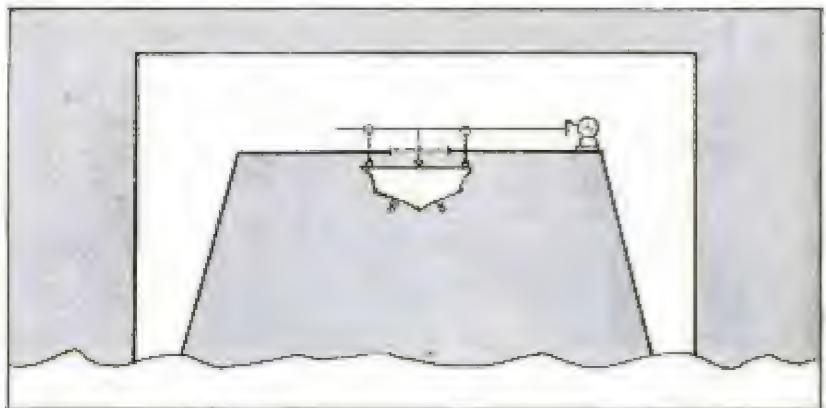
which the conventional bow presents to the waves. As a boat rolls due to heavy seas, the low side presents more bow curve to the water than the high side. This acts like a rudder in reverse, scooting the boat off in the direction opposite to the roll. He knew, too, that the longer and skinnier the craft, the less it yawed—and he guessed it was just the long lateral keel that kept it in line.

To prove his point, he took a 20-foot motor launch, chopped off about 10 feet of stern, and ran it. The thing skittered around like a demented water bug, spinning in circles, flying off in all directions, paying no attention to the rudder at all.

Now, Wood decided, if the bow had a reverse curve on each side—with the bow resembling the open end of a "V"—yawing could be completely eliminated. For instance, when the starboard side dipped, the boat would be pulled toward starboard instead of port as in the other type—but since that motion would tend to pull the port side deeper, its reverse curve would counteract the motion instantly, and the ship would just move straight ahead.

But, with such an odd "V" in front, a boat would have a tough time getting anywhere.

Port engine room looking forward. If one 1200-hp. diesel fails, the other carries on. The ship has four engines



Wood is building a 20-foot fishing cruiser which will be suspended, as the diagram shows, in Venturi tunnel. It will be boarded by a hatch in the tunnel ceiling and lowered by winch-and-cable unit





Steering device on two-rudder Venturi consists of rudder rods which are run up stern to the deck and fastened to big metal quadrants which are tied together with stout cable. When one quadrant turns the other goes with it

Water must flow past the curves—not into a trap—in order for the idea to work. The only answer was catamaran hulls, spaced apart—an ancient hull form used by Polynesian fishermen hundreds of years ago. But no one had ever applied aerodynamic principles to it, and that's what Gar Wood had in mind.

Wood went to work with balsa models. He took a conventional flat-bottom hull, so slim and racy that the scale model capsized instantly when put in water. This he split lengthwise along the keel line, then exchanged sides, putting the port side on the starboard, and leaving a sizable space between them. Thus, the long, sloping curves of the hull lines bellied toward each other

along the inside of the passageway between the halves, forming a Venturi-shaped tube after the two hulls were bridged with a deck section made of old car-box tops. The outboard sides were perfectly straight and flat.

By 1939, the experiment had resulted in a 36-foot model that had stability and speed out of all proportion to its size. There was only one trouble. Wood, who never swears, explains it thus: "The goldarn thing wouldn't turn a darn."

Those straight outboard sides wouldn't give the double rudders a chance. By 1944, Wood had licked the problem by building a slight inward curve near the stern on each outboard side. Now, when the rudder turned, it became an extension of this new curve and the boat could almost spin around on a dime. The more pronounced that curve, Wood found, the shorter the turning radius of the boat.

In building a big 188-footer in such a revolutionary pattern, Wood had to give plenty of thought to stress and strain. No one was better equipped to do it. His Miss Americas had to be acmes of perfection in strong, paper-thin construction. "At a hundred miles an hour," he recalls grimly, "water has as much 'give' as a goldarn concrete slab."

In Miss America VI, he was making a test run

Motorboat takes a run through the Venturi tunnel. The hulls are only eight feet across at widest part and the over-all beam of ship is 40 feet

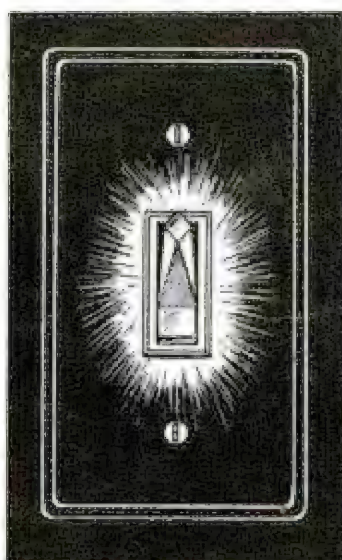


Water Jet Sprayer Washes Cars

One man can wash an entire car without moving his feet with a machine that shoots jets of water and soap on all surfaces. The washer is connected to existing water and air lines and has its own supply of soap. An eight-foot steel arch and pivoting wash arm span the car. The operator merely swings the counterbalanced arm, first left and then right over the car. The soap and water rinses shoot down against the surfaces. Provided with the unit are "plug in" sponges for touching up the car if an exceptionally clean wash job is desired.



Designed for filling stations and garages, the machine can wash 50 cars per day with little manual effort.



Light Switch Glows When Off

Built into a new toggle switch is a tiny neon lamp that glows whenever the lights are off, eliminating fumbling in the dark. The little lamp is seated within the switch housing and automatically comes to life when the switch is turned off. The glow is reflected out through the transparent switch handle. The neon lamp uses less than 10 cents worth of electric current a year in a community with average rates.

(1) DONALD S. CHASE, SPRINGFIELD, MISS.
PAT. 2,776,700
Stainless steel now can be made a lustrous black instead of its natural dull silver tone by immersing it in a bath containing four chemicals and heating it to a temperature of 250 degrees Fahrenheit.

Tiny French Car

Just about the smallest production car in existence is the Flea-Way, produced in France by the S. T. R. O. J. Company. The tiny auto is made of aluminum. A one-horsepower engine drives the midget at a top speed of 45 miles an hour.

The WHERE-TO-FIND-IT INDEX, available without cost from Bureau of Information, 200 E. Ontario St., Chicago 11, lists sources of further information not given in the index on pages 10, 14 and 24



Sighting-In the "BIG 5"

PROBING the outer reaches of space with its photographic eye, a giant telescope-camera of unusual design is "scouting" the heavens for the world's largest telescope, the 200-inch reflector on Palomar Mountain.

Known as the "Big S" because it is the largest Schmidt telescope ever built, the mortarlike telescope-camera takes sharp, wide-angle photographs of the heavens. From these pictures, astronomers select unusual phenomena for intensive, pin-point study with the 200-inch giant. Said to penetrate about 10 times deeper into the heavens and cover 1000 times more space than previous telescope-cameras, the Schmidt is a 36-ton, streamlined marvel housed in its own dome. A combination reflector and refractor, the Schmidt uses a 48-inch correcting plate or lens at the "muzzle" of its 24-foot tube to spread incoming light rays uniformly over a 72-inch mirror at the breech. The mirror reflects the light rays back up to the photographic plate.

It is this correcting lens which is the key to the wide-angle, distortion-free coverage of the camera. Based on a design developed by Bernard Schmidt in Germany in 1930, the lens is high in the center on both faces, then dips in equal hollows away from the center and rises again at the edges.

One of the first discoveries made with the Palomar Schmidt was a tiny and previously unknown planet or asteroid having a diameter of about a mile. Now the instrument is being used to make a complete photographic survey of three fourths of the heavens, a task that will require about four years. Reaching into space a distance of 300,000,000 light-years, it is spotting "targets" for its 200-inch Palomar partner.

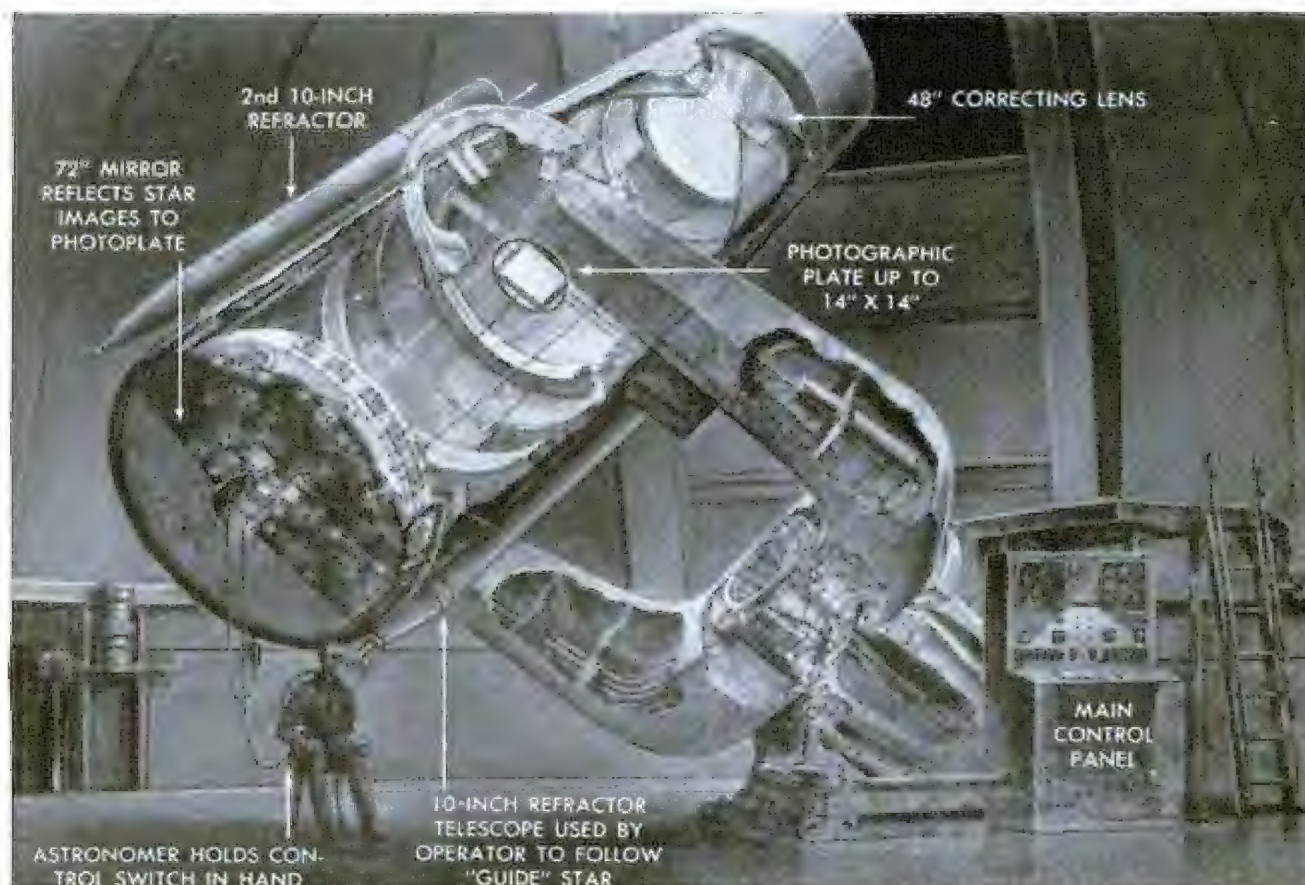


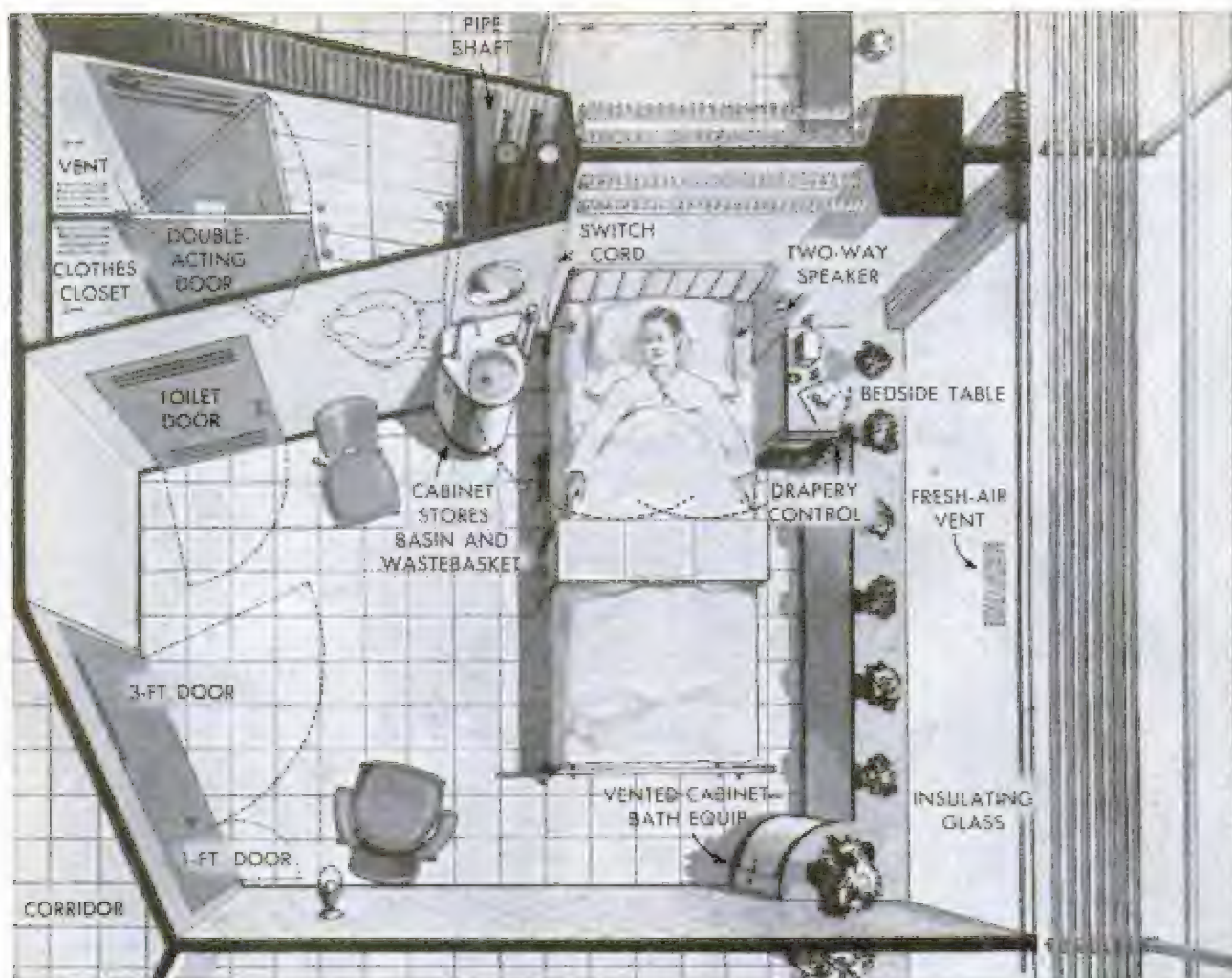
Above, the North American Nebula of the Milky Way, as photographed by the "Big S." Below, the main control panel of the Schmidt with the telescope-camera visible in the background





Above, the 48-inch Schmidt looks like a streamlined mortar as it points toward the heavens. Below, cutaway drawing of the "Big S," which acts as a scout for the giant 200-inch Hale telescope at Palomar. Notice the location of the 48-inch correcting lens and the 72-inch reflector. The photoplate is in the center





Self-Help Hospital Room

Patients in hospital rooms of a new design can help take care of themselves, thus giving nurses more time and cutting the cost of hospital operation. The room also requires about 30 percent less space than the minimum now recommended. The private room was designed by Marcus and Nocka for the Peter Bent Brigham Hos-

pital to be built in Boston, Mass. All mechanical services including oxygen, suction, electric wires, telephone outlets and plumbing are installed in a central shaft near the head of the bed. The patient can even adjust the window shades and operate light switches without calling the nurse. A two-way speaker in the wall gives him direct contact with the nurse's station. One bath is installed between two rooms.



Air-Filled Rollers Help Beach Boat

Boats weighing up to 1000 pounds can be rolled up on the beach by one man when a pair of air-filled "cushion" rollers are used. Made of rubber and canvas, they function like roller bearings. Low air pressure allows them to conform to both the hull's shape and to stones and depressions on the beach. The rollers can be inflated by lung power and when deflated a pair requires less space than a shoe box.



Giant's "False Teeth" Float Through Busy Sea Lane

Shaped like Paul Bunyan's lower plate, complete with eight-story-high bicuspid, a colossal iceberg was "frozen" in its tracks by a U. S. Coast Guard photographer flying over the North Atlantic sea lane. Icebergs, denture-shaped or not, are a menace to ships and the International Ice Patrol, operated by the Coast Guard, makes regular

flights over the North Atlantic during the iceberg season to spot and report the floating menaces. The unusual berg, shaped by the swirling sea, was photographed in the Grand Banks area, through which passes the world's heaviest sea-borne traffic. Ships are kept informed of the location of icebergs by Coast Guard radio.

Cars By the Pound—Latest Price Idea

Now you can buy used cars like meat—just pay a certain price per pound. Bob Portwood of Decatur, Ill., originated the idea of selling cars by the pound. His prices vary from 3 to 79 cents a pound, depending upon the age and condition of the car. His sales have climbed 50 percent.

☐ On turf runways, the average airplane tire will last three times longer than on concrete strips.



WHAT'S NEW *For Your Home*

A four-page "shopping section"
dedicated to modern homemakers



CLOTHESLINE LOCK, right, holds a line as taut or as slack as you want it and it can't slip. You just put the rope over a pulley at one end of the lock, flip down a lever and the line is held tight



VENETIAN BLIND, below, has no cords. You raise and lower it as you do a window. Slats can be removed for cleaning (see inset). Grooves on sides of window keep blind from flapping in the wind



SEWING TABLE, above, is designed to hold a portable sewing machine flush with the top. Sliding panel keeps material off the floor. The sturdy table doubles for bridge games. Its legs fold for storage



FOUNTAIN NOZZLE, above, converts faucet into a bubbler. Normally, nozzle directs water straight down, but when a lever is raised, it diverts water upward



CANDLE GRIPPER takes the wobble out of candles. Pushed into the candlestick, it grips the candle base as it is turned



ALUMINUM TRAYS for home freezing have a fast-sealing feature. They can be heated without damage



SERVING TONGS are formed by a plastic spoon and fork hinged at one end. They can be used separately



REVOLVING BRUSH, driven by air pressure from tank-type vacuum cleaner, scrubs and polishes floors

DISAPPEARING CLOTHESLINES roll up like a window shade inside an aluminum housing to stay clean and out of sight. On washday, the crossarm is pulled out and hooked to a tree or wall, unreeling 150 feet of line



WHAT'S NEW *For Your Home*

Continued from preceding page

VEGETABLE REAMER, below, pulps and juices onions, potatoes and other foods as it hollows them for salads and baking. Twisting the tool in the vegetable does the trick



AUTOMATIC WATER HEATER, below, fits in a corner of the kitchen, providing work space on its table top and using "dead" corner space. It is electrically heated and holds 50 gallons



HOT OR COLD, this picnic basket will keep food and drinks either way. Vinylite plastic liner is insulated with Fiberglas



KNITTING requires no skill or needles with a peg-studded Tenite hoop. You wind yarn around the pegs, lift it from one row of pegs to the other with a hook and the knitted work comes out a center slot

TOWEL HOLDER has four rubber grippers that work with a gentle push of a finger





ARMCHAIR CRIB is a space saver. Days, it's an armchair. Nights, it becomes a crib



PANCAKE GRIDDLE has a thermometer built into the handle so you know when it is at the correct heat for best results

INDOOR FIREPLACE GRILL, below, fits any fireplace. It swings out for convenient inspection of food and slips off for storage



CAN PUNCHER pierces the top of a tin can in two places when you press it down



SUITCASE CRIB is a boon to parents who want to travel. It all folds up to form a neat suitcase in less than one minute





Above, inspecting camera installation for filming tractor-type landing-gear tests. Below, track tread area is three times that of double tires

Showing Aircraft pictures



Portable Airport In Bomber Gear

Motion pictures made by a camera attached to the plane's nose recorded the first tests of track-tread landing gear on a bomber. The gear was installed experimentally on a Boeing B-50 Superfortress, weighing 164,000 pounds, to investigate the possibilities of using unimproved runways for warplanes. The gear serves as a portable airport and the camera recorded the first taxi trials.

Hand Cutter Drills Holes in Glass

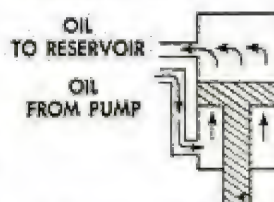
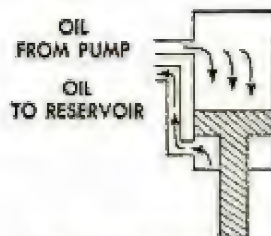
Held and rotated like a screwdriver, a cutting tool drills holes in glass, plastics or ceramics. Provided with the tool is a fluid to drop into the hole being drilled, preventing the drill from becoming dull. The drills are available in $\frac{1}{4}$ and $\frac{3}{8}$ -inch sizes, with special sizes furnished upon request. They also are available without the handle for use in such drilling fixtures as breast drills and power drills.

☛ On the average, 40 persons in every 100 are subject to seasickness and usually 35 of these unfortunates get over it after a few days at sea, but the remaining 5 never seem to become accustomed to the roll of the ocean.



Small Bench Press Has One-Ton Punch

Although it packs a punch of 2000 pounds, a self-contained hydraulic press that plugs into a standard household outlet handles materials with kid gloves. There is no shock load of damaging impact. Instead, the bench-type press builds up pressure after the ram meets the work. Length of stroke, speed and pressure are preset to meet the requirements of the job. If desired, a special control valve gives the press a vibratory action, delivering short, repeat strokes of a preset pressure. This action is used in working certain metals and granular materials. Dual control levers require two-handed operation, an important safety factor that keeps the hands away from the



work area. The press is used for blanking plastic novelties, embossing leather, stamping and dry-pressing ceramic articles.

Automatic Pilot for Light Planes Weighs Only 20 Pounds

Some Beech and Cessna models will introduce a new "flyweight" automatic pilot for light planes. Invented by Bert Carlson of Cleveland, it weighs only 20 pounds in

contrast to the 140-pound instruments used in larger craft. A turn-and-climb knob maneuvers the plane and an altitude switch maintains it at the desired height.

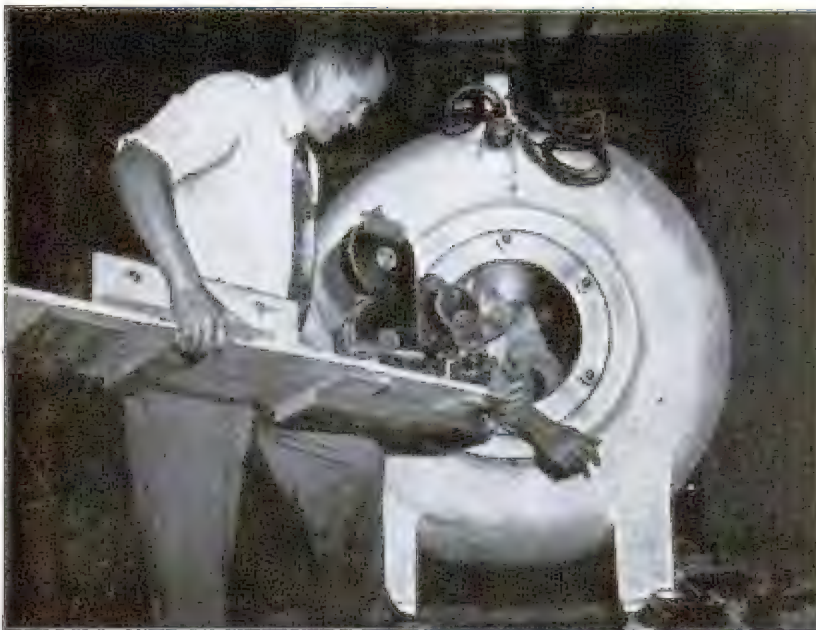


Hand-Drill Adapter Cuts Mortises

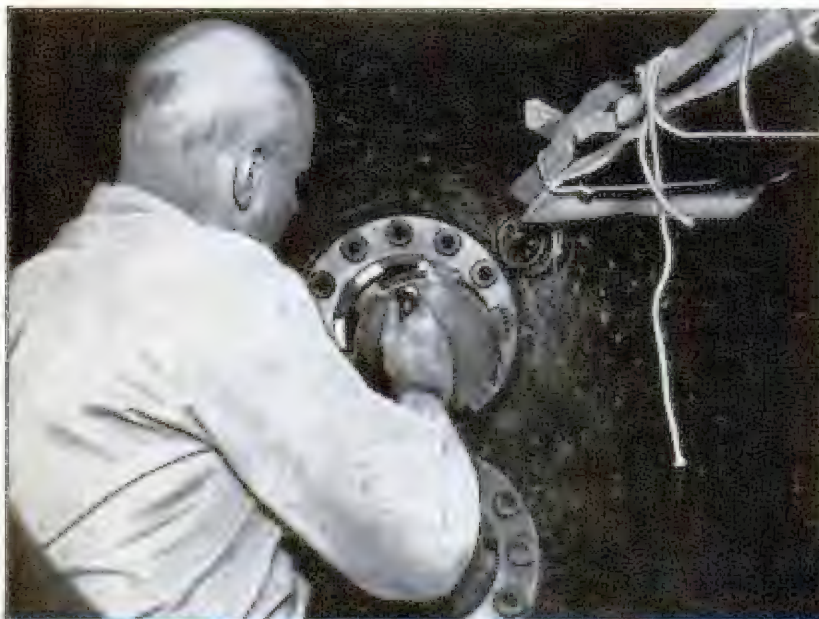
Mortises are cut on the job by a portable electric drill equipped with a new adapter that fits any standard chuck. It takes only a few seconds to make the change and any mortising chisel can be used. The tool is especially useful for mortising doors for locks, and for other work when the parts already have been assembled. As a router, the tool does the work of a chisel in much less time. The adapter also can be chucked in a drill press, eliminating much of the time required for installing conventional mortising attachments. The adapter and three chisels are available in kit form.



Deep-Sea Diver—4500 Feet



Barton pulls the 35-mm. camera into the steel ball. It can be operated manually or by remote control. Below, undersea explorer practices installing metal plug in window in case glass starts cracking



THROUGH chattering teeth Dr. Otis Barton said, "Let's hold up here. There are so many things going by it kind of makes me dizzy."

Topside, the winch ground to a halt and the steel cable no longer rolled off the drum. Dangling from the other end of the slender thread was a steel ball, and inside the ball crouched Barton, 4500 feet beneath the surface of the ocean. The scientist, who now rested far deeper than man had ever penetrated before, surveyed an eerie world of liquid shadows.

It had been that way during most of the descent. At 2500 feet he spoke into the telephone. "I see a barrage of luminescent, spiraling shrimp beating against the window. They seem to splash when they hit. . . . It's getting colder by the minute. . . . A long, thin, brilliantly lighted fish went by. It looks like an eel."

When he passed the old record of 3028 feet he reported that he was crouching in the middle of "an unbelievable world." At 4100 feet his lights suddenly went out, but he continued to drop to 4500 feet in the fluid darkness.

Listeners topside heard him say, "The ball is jumping up and down. . . . There goes a



Down

big jellyfish. I never saw anything like that before. There's a spot of light with a circle around it. . . . I see all forms of luminous sea life. I am amazed to see so many luminous things at this depth. The water is beautifully, unexpectedly clear, as clear as it was at Bermuda."

During the descent the scientist took photographs of this strange world. This was Barton's third attempt to drop 6000 feet into the blue Pacific off Santa Cruz Island, Calif. The first time the lights of his wondrous steel ball failed at the 2500-foot level. The second effort ended when a floodlight was smashed at 400 feet.

Barton's ball, known as a benthoscope, weighs 7000 pounds. Made of cast steel, it is 57½ inches in diameter and is dropped on a slender ⅝-inch cable from a crane on a barge. Power and telephone lines are fastened to the cable.

The heavy little sphere is the end product of years of study to discover a means to penetrate the seas to depths never before visited by man. Barton was associated with Dr. William Beebe in the bathysphere descents in the Atlantic 15 years ago. At one



Water sprays from the strange craft's wooden wheels as benthoscope is hauled in after test. Undercarriage wasn't used during the record dive

point during his record trip Barton remarked, "I wish Doctor Beebe were here with me. He might know what some of these things are. I don't recognize them." The benthoscope is designed for use in depths of 6500 feet, twice the record depth to which the bathysphere was lowered.

But Barton didn't design the benthoscope merely as an elevator which would lower





It's not exactly comfortable inside, but Doctor Barton's steel ball is built to carry two undersea explorers

him into the Pacific and then return him to the surface. The steel sphere actually is an undersea vehicle which will be towed across the canyons of the ocean floor. The record test was made without the undercarriage which makes movement possible.

When used as a vehicle, the hollow steel ball is mounted on two huge wheels and a roller. As an undersea tractor it will roam the mile-deep submarine canyons that are oceanic counterparts of land valleys.

Eventually it will be used for close-up visual and photographic studies of the floors and walls of several of the great canyons such as those off La Jolla, Redondo and Monterey, Calif. Until now these canyons could be explored only by soundings. One typically large canyon is clearly traceable 70 miles offshore. Such canyons usually appear at the mouths of present or ancient land river systems.

(Continued to page 270)

Undersea wagon has two wooden wheels in front, a roller behind. Sphere can be wrenched free in an emergency





Heli Corporation photos

Both leading-edge slats, left, and full-span flaps (arrows), right, increase lifting ability of Heliplane wing

Slow-Speed Plane Lands and Takes Off From Tennis Court

Slowness, not speed, is the outstanding feature of a new light plane that flies under perfect control at as little as 27 miles an hour. Conventional craft approach dangerous stalls at 50 miles an hour. Called the Heliplane because of flight characteristics similar to both the helicopter and airplane, it was designed by two college professors, Otto Koppen of Massachusetts Institute of Technology and Lynn Bollinger of Harvard. Both are pilots. It can land in a space

the size of a tennis court, yet has sufficient power to take off and climb from the same small area at an 18-degree angle, about three times the usual rate. It is both stall and spinproof. The design combines an out-size, slow-turning, high-thrust propeller with such known high-lift devices as leading-edge slats and full-span flaps, and a unique control system with a split rudder. Noise is almost eliminated by gearing down the propeller and using a "hush box."

Bomb Experts Use Television "Eyes" for Dangerous Work

Danger is eliminated by television cameras that act as "eyes" for operators working by remote control on shells and bombs for the Army Ordnance Department. It is the first known industrial use of television. The camera is mounted on the danger side of a heavy concrete barricade, focused for close-ups of the removal of fuses or high-

explosive boosters or complete disassembly of missiles. The tools are manipulated by remote control. A single camera transmits identical images over a coaxial cable to viewers at as many as 10 different locations, and over a mile away. It replaces experiments with mirrors which did not produce clear images at a safe distance.

U. S. Army photos





Above, the 60-inch disk saw spins out of water when the boom is raised. Below, a tree falls as it is cut six feet below the surface of the lake



Lumberjacks Go to "Sea"

Lumberjacks have turned sailors on the 21,000-acre reservoir formed by the Petenwell Dam on the Wisconsin River as they cut down standing timber with a submarine saw. Driven by a 75-horsepower electric motor, a 60-inch disk saw mounted on a boom on the bow of a barge reaches six feet underwater to saw off trees. Four paddle wheels give the barge great maneuverability in carrying the saw blade to the trees. As the trees are cut, they are hauled ashore by tugboats. The barge, called the Swordfish, was built for the job by the Wisconsin River Power Co. The trees are being cut to open the huge lake for recreational purposes.

Bowling's Mr. Big

By Aubrey O. Cookman, Jr.

THREE easy-to-correct faults are usually the difference between poor and good bowlers, according to Connie Schwoegler, world match-game champion.

Connie should know. Son of an American Bowling Congress titleholder, the husky, blond star from Madison, Wis., began as a pinboy to make his career by studying the game from both ends of the alley. His 217.18 average in the 72-game All-Star tournament of 1949 is the highest ever rolled in a meet that annually attracts the world's greatest bowlers.

One of the most common mistakes, Schwoegler says, is allowing the ball to come down on the alley too soon. Bowlers should toss the ball well out ahead of them, from 12 to 18 inches beyond the foul line, to have it work most effectively against the pins.

A correctly thrown ball skids part way, then changes over to a rolling motion that makes struck pins topple over at an



Above, world match-game titlist Connie Schwoegler follows through on a strike delivery. Below, stroboscopic camera catches a perfect 1-3 strike hit. For special PM photos, from one to six lines were drawn around six front pins to indicate their original positions. All stroboscopic photographs by Jay B. Leviton.



angle and—in turn—knock down other pins. It slides in the direction it is released, then revolves in the direction given it by the fingers when it leaves the hand. The rolling begins after friction has gradually overcome the slide's initial force. With a good "fighting" or "mixer" ball, the few pins actually struck sweep those that remain off the alley.

A ball thrown too speedily skids the entire distance, smashing struck pins off the alley while they are still upright, before they assume their more potent, horizontal pin-hitting angle. At the other extreme, a "slow poke" ball begins the rolling phase too early, dissipating its effectiveness before reaching the pins. Somewhere between those two extremes every bowler must experiment to find the medium speed best for him.

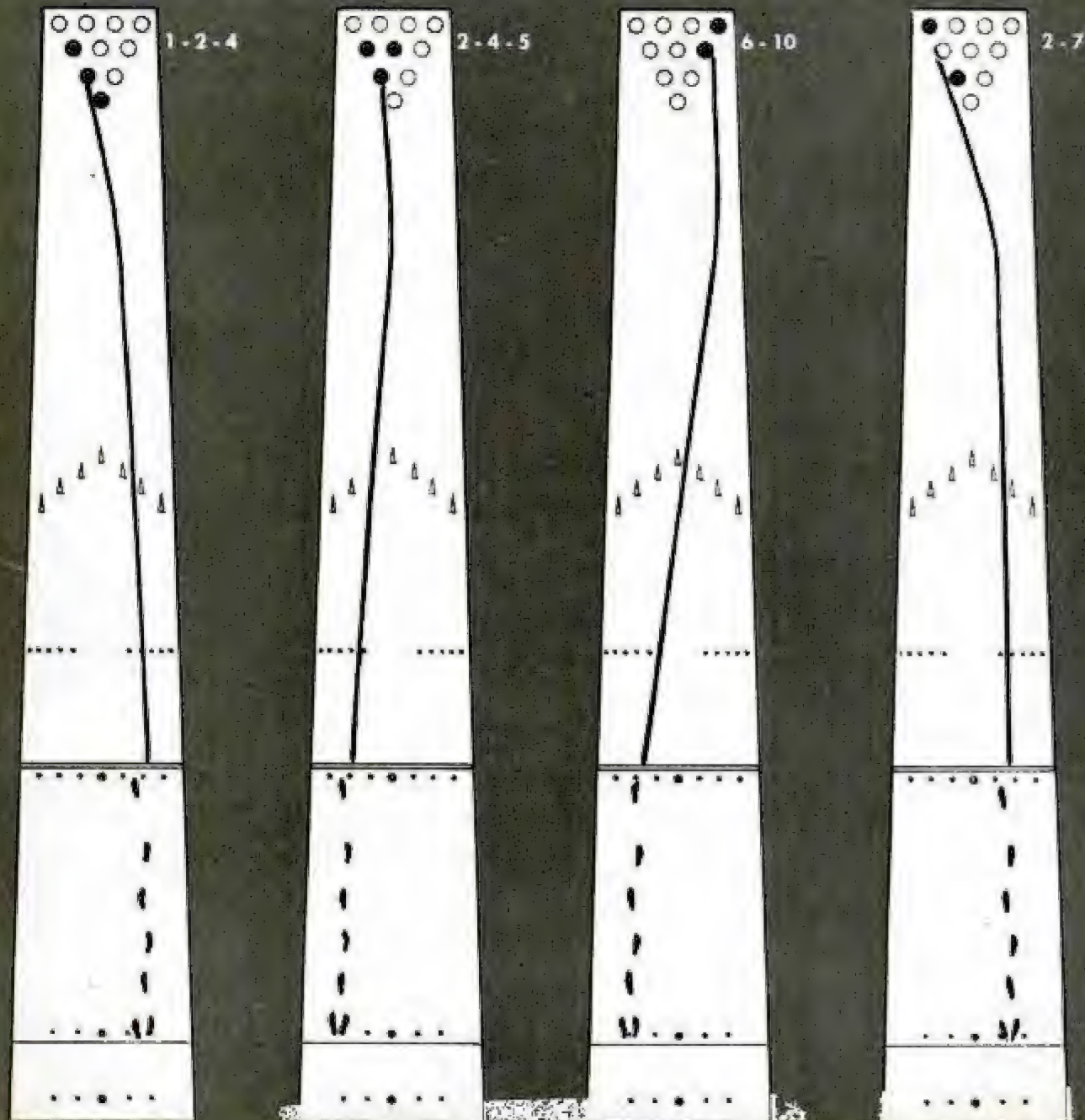
Here is how Connie plays for the 1-2-4 and 2-4-5 spare setups. He favors having the ball strike as many pins as possible, instead of relying on caroms

Racing up to the foul line is a second frequent and harmful error, the champ says. A hurried approach spoils the rhythm of the delivery. Moving toward the release point at a medium pace provides enough momentum and doesn't upset the timing. It likewise conserves energy, important when you remember the average bowler repeats that approach 50 or more times every night he rolls.

Avoid crowding the foul line. The few inches closer it brings the kegler to his target means nothing, compared to the constant mental hazard of penalties for overstepping the line. Allow a safe margin of four or five inches between your toe and the alley's start.

Connie believes failure to follow completely through on the delivery motion is the costliest mistake of all. He insists a bad-

Roll diagonally across alley for side-pin "leaves." With a head-on approach there is always danger of ball dropping into gutter or hooking too sharply



acting ball can't be thrown if the hand is allowed to continue its normal arc after releasing the ball.

As the ball is thrown the wrist is turning inward, from right to left for a right-hander, and the palm is facing the pins when the arm swing ends. This produces either a hook, which veers sharply to go between the 1 and 3 pins for a "pocket" hit, the prize strike-getting target, or a curve if the wrist turning is done more slowly.

Careful attention to the follow-through is also the best way to detect and then eliminate a "back up" delivery, which produces a less-effective ball that breaks in an opposite direction from a curve. With a back-up, the wrist turns outward instead of inward at release time and the palm faces upward as the follow-through ends. Women, generally having weaker wrists than

men, are especially disposed to this error.

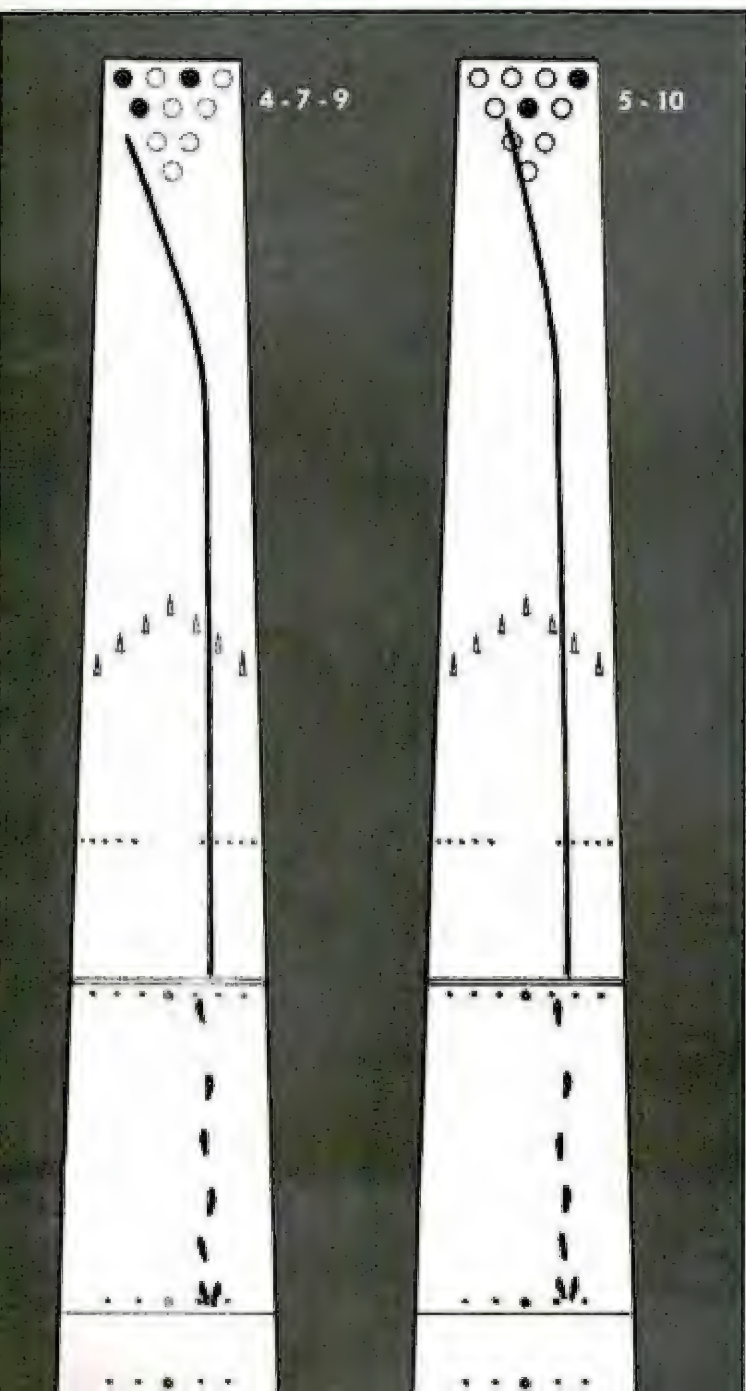
On the subject of deliveries, Connie has perfected a unique finger-tip grip that prevents sore knuckles—an "occupational disease" among tournament bowlers. He also thinks it helps those who can't throw a hook with a conventional grip.

Schwoegler began experiments with it after an exhausting exhibition tour following his first All-Star victory. Bowling two and three times daily for weeks, with two fingers, had left him with a painfully sore middle-finger knuckle, so swollen he couldn't hold a ball comfortably.

What he eventually hit upon was a three-finger grip, with a quarter-inch vent connecting the bottoms of the thumb and second finger's holes. The air channel eliminates the vacuum effect on the thumb and provides air circulation to help keep it dry.

Cutaway shows ¼-inch vent between thumb and second-finger holes in Schwogler grip. Bottom, comparison of new grip, left, with the older type

Brunswick-Balke-Collender photos





Multiple-exposure photo of champion Schwoegler from beginning to the end of his rhythmical five-step delivery. He stops several inches short of the foul line and throws the ball from 12 to 18 inches out ahead

The thumb, which leaves the ball first, is inserted all the way into its hole, while the two fingers go into theirs only as far as the last joint. The third-finger hole is conventional, with no vent.

Connie "warmed up" with his finger-tip grip for last year's championship, rolling successive scores of 299, 278, and 279 for an amazing near-perfect performance. When the actual tournament began, he shot his eighth 300-game, the first ever made in the finals of bowling's "World Series."

Since then, coaching and making personal appearances all around the country for Brunswick-Balke-Collender, bowling-equipment manufacturers, Schwoegler hasn't had a trace of sore fingers. He gives full credit to the new grip.

In a sport marked by few changes over the years, the sharp trend from two to three-finger balls is surprising. About four fifths of the game's top stars now hold the ball with three instead of the long-favored, two-finger grip. The former allows two fingers to share the strain of the lifting action that otherwise is on the second finger alone. Only one star bowler, Ed Botten of East Orange, N. J., uses a four-finger grip.

While the champion uses a five-step approach on delivery, he doesn't insist on that for others. The four-step approach is about equally popular with topnotchers.

"Your height and general build should generally determine how many steps are best for you," he says. "I'm big, six feet three inches and 212 pounds, but I have a habit of leading off with a very short step—almost a shuffle—and I need five to reach the foul line comfortably. Also, I start farther back than most men. The big things to remember are to move forward in a straight

line and to have the body in perfect balance on that final step—with both shoulders in line and squarely facing the pins—when you let go of the ball."

Despite his big frame, Connie glides up to the foul line smoothly. Occasionally, he admits, he has to remind himself not to approach too slowly. After he has rolled a half dozen or so balls to find out where the alley ranks between "fast"—a slick surface on which hooks won't take readily, or "slow"—a lane on which they "grab" and break more than usual, he sights a spot about 16 feet ahead for his ball to cross on its way to the pins. With that as an aiming point, Schwoegler can ordinarily roll eight out of 10 balls into or very near the pocket.

Shooting for spares, Schwoegler says his main object is to hit as many pins as possible. "That sounds obvious," he explains, "but you'd be surprised how many bowlers disregard it and gamble with fancy carom shots. Wood that your ball actually hits won't stay up, while you can't depend 100 percent on pins doing what they are supposed to do on carom shots.

"Many pretty fair strike bowlers never get out of the novice class because they don't take time to figure out the surest hits for spare setups. Educate yourself on how pins behave when struck. It helps, when you're a spectator or waiting to roll, to study various spare combinations on the alleys and decide how you'd play them. Then compare your decisions with the other fellows' results, the way they actually played the 'leave.'

"For example, I make my usual straight-line approach from the left and throw diagonally across the alley for pins left standing on the right, like the 10. When



Above and right are illustrations of how tricky 2-7-8 split is played and made. The 2 pin is hit and deflected against the 7, while the ball itself carries through to knock down 8. Timing is vital on this shot

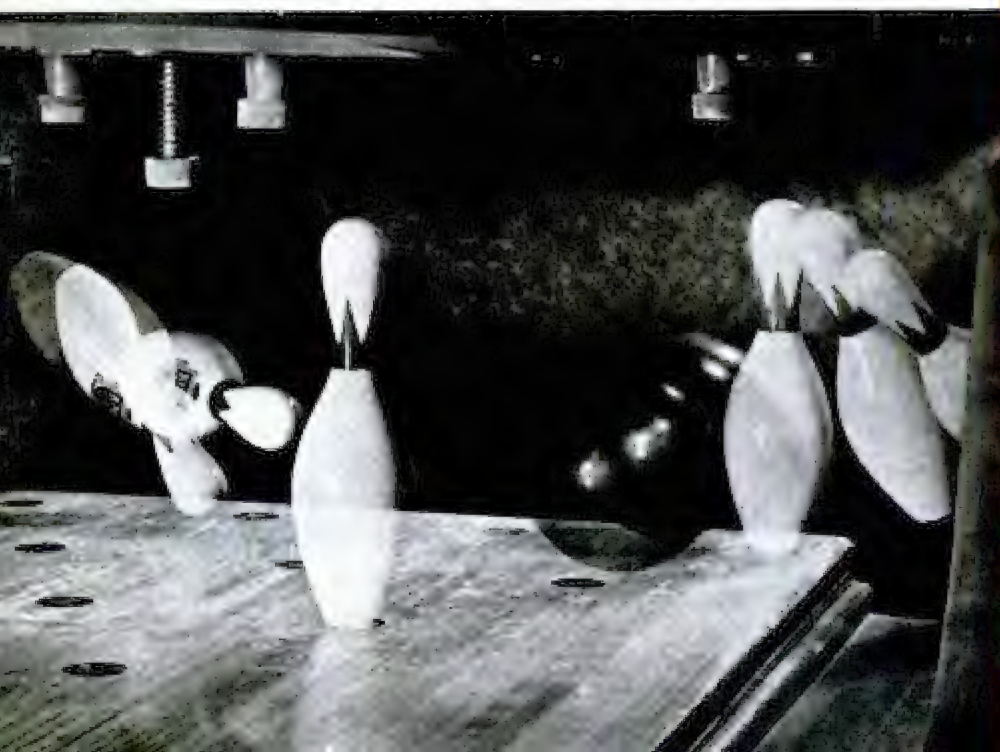
corner pin leaves are approached head-on there is too much danger of the ball dropping into the gutter, only a few inches away, or hooking too sharply to the left. For pins on the left, like the 7, I simply reverse this and roll from well over on the right.

"On the 1-2-4 spare, often left when the ball doesn't hook enough, I play my shot on the left side of 1, hard on the 2 pin.

"Don't switch back and forth between different styles of delivery for various spare setups. Learn to control one, preferably the hook because it is the most reliable strike-getter, and use it—with slight variations—for all situations. The sharpness and amount of the ball's break, as I have pointed out, depend on how quickly and how much you roll your hand over on release.

"Above all, think before you throw!"

One of the familiar "baby split" combinations, the 3-10, is being made in stroboscopic photo and diagram, below and right. After hitting 3 on the right side, the ball is deflected slightly and smashes full against 10





Hydraulic Loader

Hydraulically operated, a loading device for trucks makes light work of raising and lowering heavy barrels, crates and other bulky items. The operator rides on the platform with the material and controls the movement of the elevator by a convenient hand lever. When not in use, the platform swings up against the side of the body, adding only a few inches to the width of the truck.

Metal Coated With Powder

One metal is coated on another by a new method in which a layer of metal powder is rolled into the base metal. The powder-coated metal is heated to a degree just below the melting point of the two metals in an atmosphere of pure hydrogen to prevent oxidation of the powder. Then the powder is "cold rolled" into the base metal forming a coating, the thickness of which is determined by the depth of the powder layer.

Old Swedish Mines Converted Into Bombproof Oil Depots

Two old feldspar mines in Sweden have been converted into underground oil depots that are considered practically bombproof. A unique feature of the oil "tanks" is that the fuel floats on a few feet of salt water and can be skimmed off to within

$\frac{1}{2}$ inch of the water level. The old mines have a total capacity of about 14 normal tanker cargoes of oil. A copper heating coil installed in the mine maintains the oil at a suitable viscosity. Oil is pumped directly from tankers into the mines.

Shelf-Size Loran

Loran, the war-born navigational system, now has been redesigned into a compact unit for small-ship use. The system is effective in any kind of weather to locate the ship's position without celestial observations. The new unit, employing miniature tubes, is so small that it can be mounted on a table or shelf. It is used by fishermen to "mark" profitable fishing grounds.

Safety Car-Door Handle

Children can't open the door when a car is in motion if a new handle is installed in place of the original one. Inside the handle is a lock operated by a key. A turn of the key makes it impossible to open the door from the inside, yet it can be opened from the outside.



Robot "Nurse" Sings to Baby

When junior wakes at 3:00 a.m., all set for a party, mother may soon be able to ignore the lusty bellows. She'll just flick a switch, roll over and go back to sleep as the yelling is replaced by soothing strains of soft melody drifting from the nursery. At least that's the theory behind Dr. Sydney Norton Baruch's "Night Nurse." His mechanical crib, powered by a $\frac{1}{10}$ -horsepower motor, sways with the motion of a mother's own arm-rocking. Simultaneously, a sound unit starts playing a lullaby recording of mother's voice. An automatic, preset timer determines the length of time the equipment is in action and the whole mechanism is put in motion by a switch at mother's bedside. Doctor Baruch, inventor of a depth bomb that was used successfully against submarines



Acme photo

in both wars, expects the Night Nurse to sell for approximately \$85 when it goes into production.

Process Borrowed From Mining Cuts Cost of Canned Peas

First used in the mining industry to remove foreign material from ores, the froth-flotation process may save over a million dollars every year in the cost of processing peas for canning or freezing. Cracked

peas, pea skins and other materials are floated out of batches of peas much faster than is possible with previous separation methods. The new technique was developed by the Department of Agriculture.



Cycle for Three

Three wheels and three seats—that's a description of a strange vehicle built by Louis Richard of Southampton, England, to provide transportation for his family. Built from spare parts, the machine is pedaled like a bicycle and travels about 15 miles an hour. The saddle-type seats are detachable for use at picnics. Richard plans to reduce pedaling by equipping the vehicle with a one-horsepower motor.

Information not listed on articles in the index, starting on page 10, frequently is listed in the WHERE-TO-FIND-IT INDEX, which is available without charge from Bureau of Information, Popular Mechanics Magazine, 200 E. Ontario, Chicago 11, Illinois

Follow the ducks

By Ed Neal

PROBABLY every businessman in America, chained to a desk and tired of the high tempo of modern life, has wanted at one time or another to chuck it all and go fishing. Not for a day or two, but for weeks or months.

Not one in a hundred thousand transmits that desire into action. One rare individual who has is 43-year-old Harold Siebens, a "retired" St. Louis sporting-goods executive. Siebens frankly admits he is tired of modern business. He took to heart the old adage "all work and no play makes Johnny a dull boy." In fact, he improved upon it. Siebens sold out his interest last year in a St. Louis sporting-goods firm, the fifth largest in the country, and took off on a two-year hunting and fishing trip.

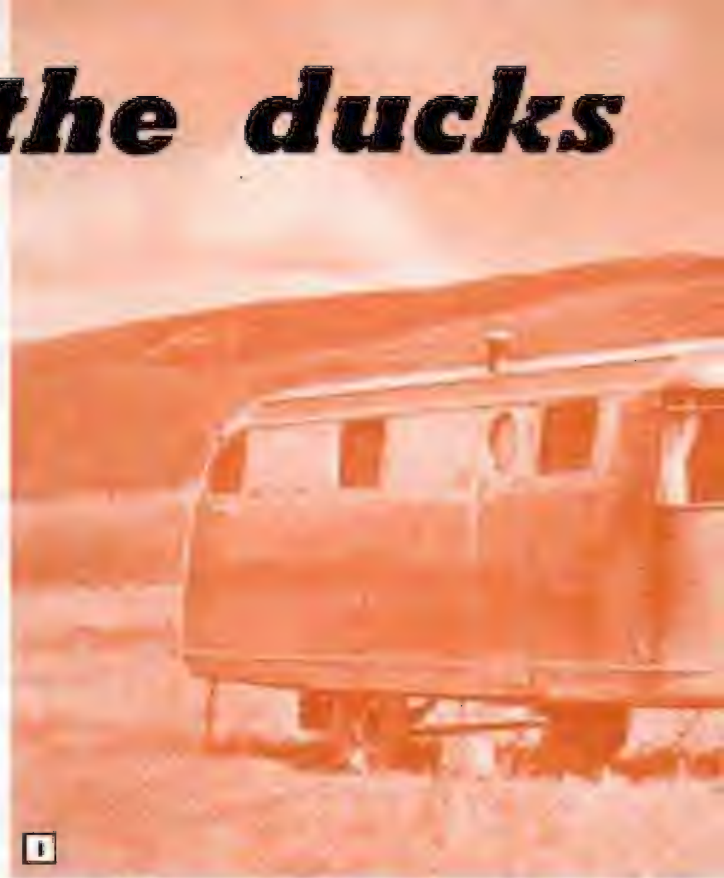
Where it'll lead him, not even he knows. In less than a year he's covered the greater part of the Western United States, has fished inside the Arctic Circle and made a brief excursion into Mexico.

A radio "ham" himself, he's known to other amateur operators of the air lanes as "the guy who gets around." That cognomen was given him by a Danville, Ill., "ham" who talked to Siebens four times—twice when he was in Alaska, once in the state of Washington and once in San Francisco.

He's logged nearly 20,000 miles on North American roads, on everything from superhighways to dusty trails. He travels in a redesigned four-wheel-drive truck, towing a 25½-foot house trailer. Most amazing thing, Siebens admits, was the fact the trailer took all sorts of rough country with but two breakdowns.

One was on the Alaska Highway, 493 miles north of Dawson Creek, when the trailer broke an axle. During the two weeks before another arrived from Tulsa, Okla., Siebens went fishing. "After all," he explained, "that's why I'm taking this trip." Another time the trailer threw a wheel, halting the trek for five days.

That specially built truck is the key to his success. It's loaded with contrivances to make travel easier. A special power plant handles all electrical needs and a filtering outfit purifies the water wherever necessary. There are radios in both the truck cab and the trailer. Compartments in the truck hold hunting and fishing gear. This includes a sectional plastic boat, two outboard motors, three rifles, three shotguns and two pistols. There are also 14 rods (three fly, four casting, one spinning and six salt-water) and 12 reels.



1. Siebens' truck and trailer "home" is equipped for comfort—and all emergencies. Here a water purifier unit is being set up in Glacier National Park

2. Fellow "ham" radio operators are gradually getting accustomed to picking up the St. Louis sportsman at odd, faraway places. He takes two sets along

3. Harold and his son Bill assembling their sectional plastic boat at Kluane Lake, well up on the Alaska Highway. They also carry a pair of outboard motors

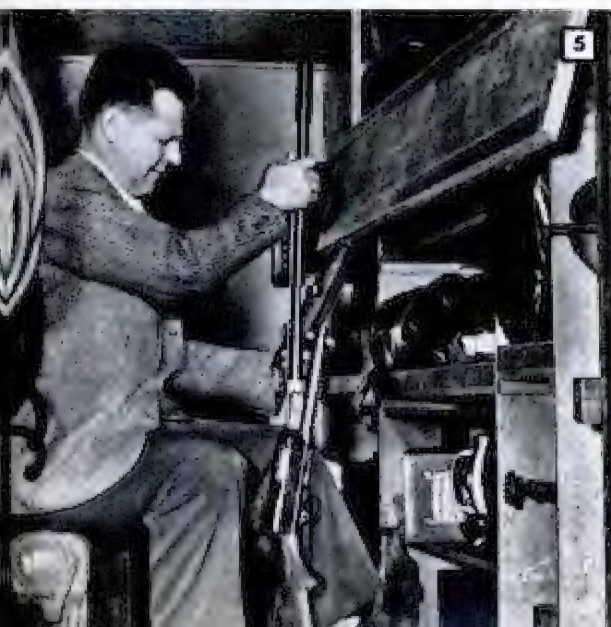
4. Via two-way radio equipment installed in the dashboard of his truck, Siebens chats with friends in St. Louis during a brief layover in San Francisco

5. In a mobile "arsenal" compartment of the truck, the retired sporting-goods-firm executive always keeps three shotguns, three rifles and a pair of pistols

6. While logging 20,000 miles on North American roads, from superhighways to rutted trails, Siebens had only two mechanical mishaps and no accidents



by trailer





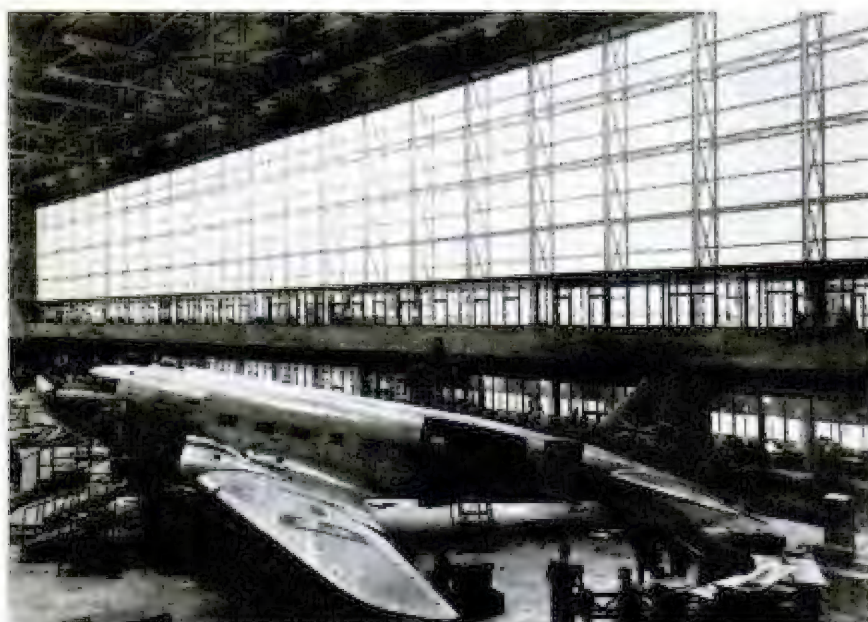
Bird in a Gilded Cage—Trailer Carries Ostrich

Probably the only man in the world to carry an ostrich in a house trailer is Dr. Wendell Hansen of West Sturgeon Bay, Wis. Doctor Hansen is a bird trainer who travels around presenting an act at church programs. He travels from city to city in a house trailer. When Doctor Hansen acquired an ostrich he had no way of moving the large bird from place to place. His solution was to build a special room on the front end of the trailer. The ostrich fits neatly inside and gazes out through a Plexiglas dome. One section of the roof slides down for ventilation. During cold weather heat is piped into the private apartment through a window in the trailer.

← Milwaukee Journal photos

Boys in Houseboat Cruise "Ole Miss"

Four adventure-bound boys recently made their way down the Mississippi River in a houseboat they built themselves from \$75 worth of materials. The youths, who live in Bowling Green, Ky., made a safe voyage and eventually tied up at New Orleans. Their ingenious floating home was powered by an out-board motor.



1000-Foot-Long Window

Winds up to 150 miles an hour can be withstood by a plate-glass window 1000 feet long and 50 feet high, covering one entire side of a Bristol, England, aircraft plant. Needing no putty and no initial or subsequent painting, the cost of maintaining the window is very low.

☞ Scientists aboard a laboratory ship recently discovered that the Hudson River Valley extends 225 miles out into the Atlantic Ocean, 105 miles beyond the point it previously was believed to end.



Cycling Signs Advertise Movies

Billboards on bikes are pedaled around Rome to advertise the latest motion pictures. Promoters hire uniformed riders to tour the streets at night on bicycles fitted



with neon signs. Automobile batteries on the bikes provide enough current to maintain the signs for eight hours. Frequently, motion-picture theaters hire as many as 10 cyclists at once, each exhibiting one letter in the title of a movie.

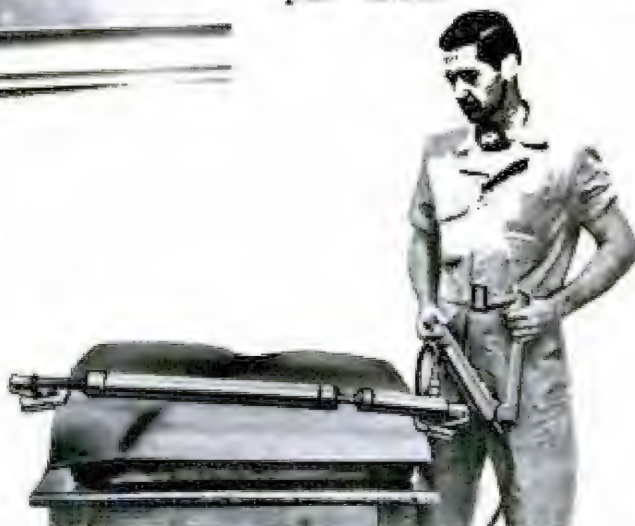


Tripod for Telescope Is Auto Window

With a swivel-headed mount that can be used with any camera or telescope having a standard tripod socket, you can use the window of your car as a tripod. The mount can be swung in any direction and is raised and lowered by the window crank. Movie fans will find it valuable for taking "pan" shots.

Door-Straightening Set →

Damaged automobile doors are returned to their original contours by a set of three clamps and a bar that operate entirely from the outside. Thus, glass and upholstery need not be stripped from the doors during the repair work. The clamps are fastened to the edges of the door and positioned so they will pull the metal panel back to its original shape. The set of tools can be used with any existing shop equipment, either mechanical or hydraulic.





Elementary school pupils are right at home inside a C-46. It serves as a classroom for their courses in aeronautics

By
Ewart Thomas

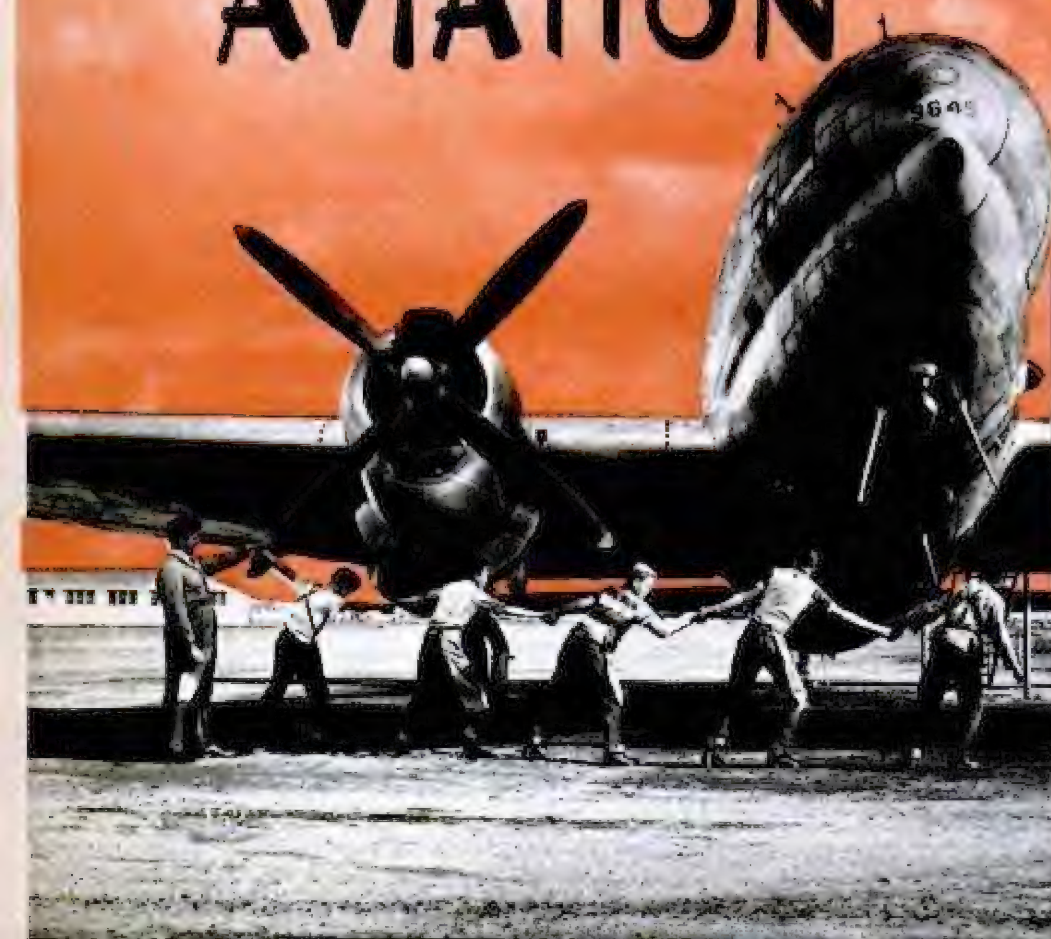
READING, WRITING AND AVIATION

WHEN an 11-year-old lad from Weedpatch casually remarks that he has been taxiing an AT-6 airplane or complains of the way he overcontrols a Link trainer, you can believe him. If he says that he just reassembled a 1000-horsepower aviation engine, he's speaking the gospel truth.

He's a student at the Sunset Elementary School, a public grade school that has its own landing field plus 1¼ million dollars worth of war-surplus aircraft. He studies aviation along with the three Rs.

Weedpatch is a small community on the road between Rockpile and Punkin

At the school air strip, pupils learn the correct way to pull a propeller through on their C-46





Fifth graders go to class inside a C-46. Bought as war surplus, the big plane was flown in by the teacher

Center, near Bakersfield in California's San Joaquin Valley. Most of the people of the neighborhood are seasonal agricultural workers who migrated west during the dust-bowl days. Nearly all of them are poor and few have had much education. Some hate to spare their children from the fields to attend school. Numbers of the children won't keep on with their education after they finish the eighth grade.

So, while they have their hands on them, the Sunset instructors drill reading and writing and arithmetic into their students and also teach a few subjects that aren't ordinarily offered in grammar school. The teachers reason that this will help inspire the students to continue on to high school and that it will widen the knowledge and points of view of those who do not.

That explains why seventh and eighth graders study aviation. There's a big thrill in overhauling an airplane engine and meanwhile the students learn a lot about internal-combustion engines that will help them when they drive automobiles or repair farm tractors. Indirectly, they learn the proper way to use tools, the value of maintenance schedules and the reasons for safety precautions.

The same applies to lectures on how airports are operated and the mechanics of how an aircraft flies. Some of the talks are given while the students are grouped around an AT-6, some are delivered inside a classroom that consists of a transport fuselage in which the students sit in bucket seats with their desks in front of them.

As a sort of graduation present at the end of the course, each of the students is allowed to sit in the cockpit of one of the school's aircraft, go through the warm-up procedure and taxi the plane the length of

the school's runway with an instructor in aviation riding along as safety man.

Ninety students are enrolled in the pre-flight and aviation mechanics courses under Charles Blair and George P. Valos, instructors. The school obtained from the federal government, as war-surplus material to be used for educational purposes, a C-46 transport and two AT-6s, all in flight condition, as well as the shell of another transport. A Link flight trainer, a stock of assorted engines and miscellaneous equipment including a couple of buildings from a flight-training field were also obtained.

Some of this equipment was trucked to the school, some of it was flown in after teachers and students had measured off and graded an air strip alongside the school grounds. The strip is 100 feet wide and 1600 feet long, lined with boundary markers, and with a windsock at one end. It is used for ground instruction purposes only, but it has been a boon to aircraft in the vicinity. Five emergency landings, including one by a DC-3 transport, have been made on the field since it was built.

Jet and rocket planes are studied in theory; however, this homemade model brings the theory down to earth





With the help of this model airport, pupils study the use of landing patterns to control airplane traffic

Basically, the Sunset school is a typical rural school, a part of the California school system. Three hundred and eighty students, ranging from 10 to 14 years of age, attend the fifth to eighth grades.

All students receive the standard instruction courses in traditional elementary subjects. All of them, in addition, are allowed elective subjects at which they spend a maximum of 80 minutes a day, four days a week. The school has classes in typewriting, drama, public speaking and music, among other elective subjects. It has its own band. The choice of interesting subjects is one of the reasons why absences from school amount to only .04 percent aside from absences due to illness.

The fact is that the school deliberately tries to capture the interest of its students. To build up this attitude, the school trustees chose young administrators who are filled with enthusiasm and fresh ideas. Peter A. Bancroft, superintendent, is 31. Harley Thompson, assistant superintendent and principal of Sunset Senior Elementary, is 32. The average age of all the teachers is 36, considerably lower than the national average. Teachers are chosen with care and are paid from \$3000 to \$5000 per year. Bancroft and Thompson require, first of all, that each teacher be a student leader. The faculty members dress informally and comfortably and the men usually teach classes in slacks and sport shirts.

The school began its progressive program about seven years ago by offering agriculture as an elective subject. The principles of good farming are discussed in class and the students learn the proper ways of doing farm chores. Under the supervision of Glenn Walsh, instructor, the 50 agricultural students operate their own 15-acre

farm that adjoins the school's air strip. The ground is partly in fruit trees and vegetable plots, but most of it is planted in barley. This grain helps feed the six cattle that the agriculture department owns. Other livestock that the students tend include half a dozen hogs, three sheep and pens of chickens and rabbits. The department owns its own truck and tractor and most of the students, from 10 years on up, have learned how to drive.

Recently, the young farmers acquired an old frame building from an Army training

By working on this in-line aviation engine, pupils learn the mechanics of internal-combustion engines



camp and one of their projects for this year is to remodel it into a classroom. They are learning a lot about construction by preparing the foundation, laying the floor and refinishing the interior.

Home economics, or homemaking, was started as a parallel subject for girl students at the same time that the farming classes were inaugurated. At first, it was necessary to hold classes in two old boxcars that were hauled to the school grounds. More recently, the department has moved into a wing of one of the new school buildings. Forty girls are studying cooking and sewing. Mrs. Jeanette Clark's cooking classroom contains four modern kitchen units each equipped with an electric or gas range, a sink, cupboards and utensils. Adjoining the units is a dining area where the girls serve the food, then sit down to sample it. The students are taught something of nutrition and what constitutes a proper meal and they take home with them recipes that have been made up to fit the numbers of people in their own families so that they can try out their meals at home.

The fundamentals of sewing are taught by Mrs. Madge Norton and the subject in-

cludes the different stitches, operation of machines, weaving on hand looms, the uses of different fabrics and the proper combinations of colors. This in turn leads to styling. The girls are encouraged to make their own clothes in class and at the end of the term they hold their own fashion show, modeling the articles they have made.

As an allied subject, Mrs. Barbara Sabovich teaches the girl students how to make and use their own cosmetics. Here again, the students learn more than the subject suggests, for the emphasis is on hygiene and good grooming. The girls compound



As a graduation "present," pupils taxi the AT-6 down the 1600-foot runway

Class is in session at the end of the landing strip. The crippled C-46 in background is used as a classroom





Tractor operation and maintenance are also taught at the school. Two students load lumber for use in converting an old Army building into a classroom

lipstick material from a stock formula and they also mix the ingredients for making their own toothpastes, deodorant creams and shampoo preparations.

The Vineland school district, in which the Sunset school is located, doesn't have enough funds for expensive educational buildings and the student population has been growing faster than the income from school taxes. To get some of the things the school has wanted, its teachers and students have planned and worked together.

(Continued to page 274)

Girl students get more than book training, too. At left, two girls are learning to operate this hand loom. Below, the boys learn by doing as they lay flooring in a new classroom, bought as war surplus





"Automoboat"

Equally at home on the water or the highway is an "Automoboat" built by Herbert J. Farrar of Miami, Fla. The 20-foot craft has two heavily ribbed tires which propel it either ashore or afloat. A smaller front wheel steers it on land and two rudder boards guide it in the water. Farrar spent two years in building the craft.

Top, when the craft is afloat the ribbed tires cut into the water like paddle wheels. Right, a smaller front wheel steers the vehicle when it is being driven on land



Easy-Aiming Rifle Has Hinged Grip

For greater aiming stability, the hinged forearm of a new .22-caliber rifle swings down to a vertical position, forming a comfortable handgrip or ground rest. The rifle is a carbine type weighing five pounds and measuring only 37 inches long. The magazine holds seven rounds and the rifle is chambered for short and long cartridges.

ⓂNails so small that it takes 95,000 of them to weigh a pound are made by the steel industry.



WIRE WORKS OF ART—and utility—in an infinite variety of shapes and sizes pour from a combination shop and factory in New York. These masterpieces in wire find their way all over the world.

The telephone directory lists the establishment simply as "Philip Huncik, frames," but this craftsman has long since outgrown that brief designation. Thirty-nine years ago he started in business making the wire forms for floral pieces—the backbones for wreaths, crosses, horseshoes for good luck and gates ajar for goodbye.

This was all right as far as it went, but soon women customers were demanding that he make lamp-shade frames of special sizes and shapes; then interior decorators, ever on the lookout for something novel and attractive, began ordering custom-built tables, baskets and shelves.

One thing led to another and today an order for a 16-foot backdrop for a display or for several thousand containers for merchandise doesn't faze Huncik a bit, despite the fact that his "factory" only occupies space equivalent to that of two retail stores.

As with many other crafts, working with wire is both an art and a science. A man lacking artistic sense could readily turn out work fit only for a chamber of horrors if his medium demanded as much sense of proportion and feeling for form as wire. A glance at the photographs showing the work sets any such fears at rest.

Science is also required. Almost everything that is made demands a large number of very exact curves, and steel wire does

not lend itself to exact treatment when the only tools are a hand and a pair of pliers.

To lick the problem, Huncik has assembled a collection of hundreds of jigs and fixtures which, when secured in vises, permit him to make any type of simple or complex curve. An "S" curve can be made by a child with the jigs, but to hold the steel wire in the hand and bend it with pliers is enough to make a strong man gasp.

Spot welders are also valuable aids, permitting wires to be joined at any angle in a few moments—a much faster and less messy job than the soldering which preceded it. Hacksaws for cutting wire, tin-smiths' shears for cutting liners, drills and an assortment of hammers comprise the remainder of the equipment.

The development of welding apparatus that would work on home current has fostered wire-working as a homecraft activity—and one which meets with hearty approval from the women, since so many decorative and useful objects result.

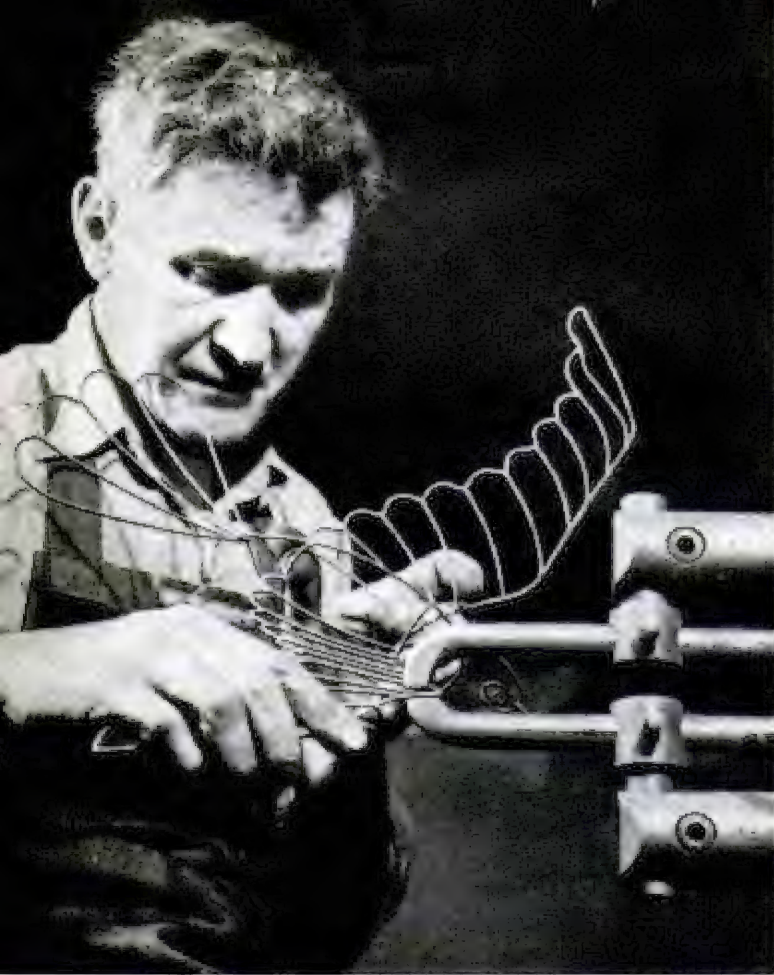
While Huncik executes a wide variety of orders for individuals, a majority of his commissions come from department stores and others concerned with displays.

Perhaps the biggest job was a canopy, almost 20 feet long, which was used by a manufacturer of bed linens and towels to decorate a display of merchandise. The same company once ordered 8000 white wire baskets in which selections of bath towels were sold as Christmas gifts. They packaged the same product in 4000 wire shelves which Huncik made.

Left, "wonderland of wire" describes the workshop of Philip Huncik in New York. He started 39 years ago making wire forms for floral pieces, later branched off into making fancy lamp shades for women customers. Below, he shapes a window fixture for a department store



ARTIST
WITH
WIRE



Above, wire-working requires a sense of proportion and a feeling for form. Here Huncik creates a bird

The 16-foot wreath which hung over the entrance of the Empire State Building last Christmas was a Huncik product, and one which he was glad to deliver. "It took up so much room in the place we could hardly move around," he said.

His work appears in the best stores, from Saks Fifth Avenue in New York to Bullock's in Los Angeles and it is highly seasonal. Wire eggs for Easter, turkeys and pumpkins for Thanksgiving, and wreaths, Santas and sleighs at Christmas.

An order for an eight-foot wire hand, to be gloved and displayed, doesn't surprise him a bit and he'll copy an antique bird cage built in the form of a castle for \$125 as readily as one for a few dollars.

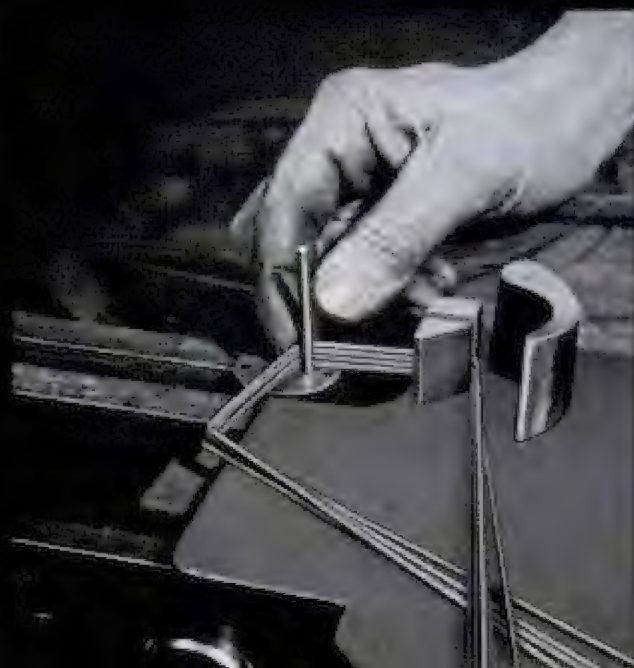
His work has been sent to China, where they have a strong preference for delicately constructed butterflies and animals, and a chap from Australia dropped by one day with an order for a Sydney department store. Cuba, Canada and England have also seen his work.

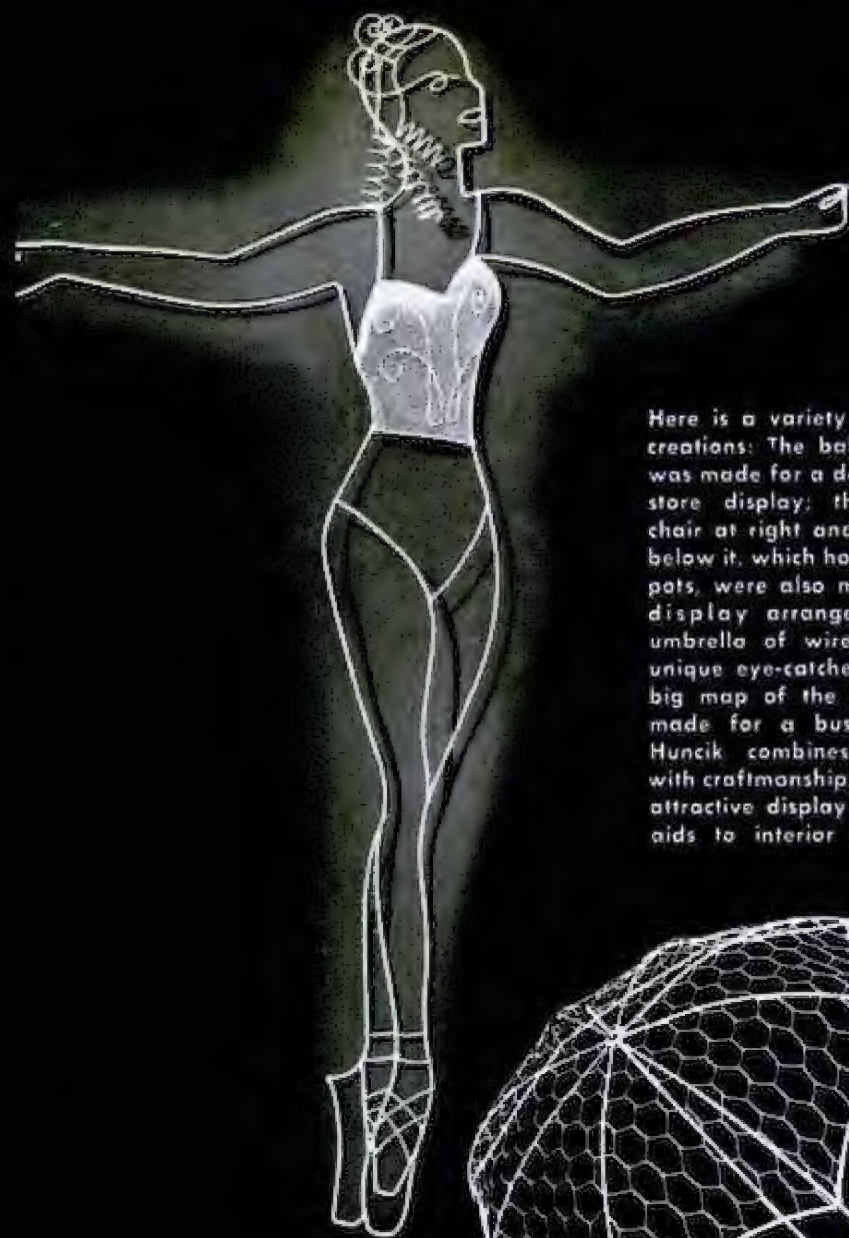
The business has grown steadily, except for the war period when he lost all his help to essential industries. Huncik soon became one of these by making hooks used to lash cargo to ship decks. But he prefers making beautiful bird cages.



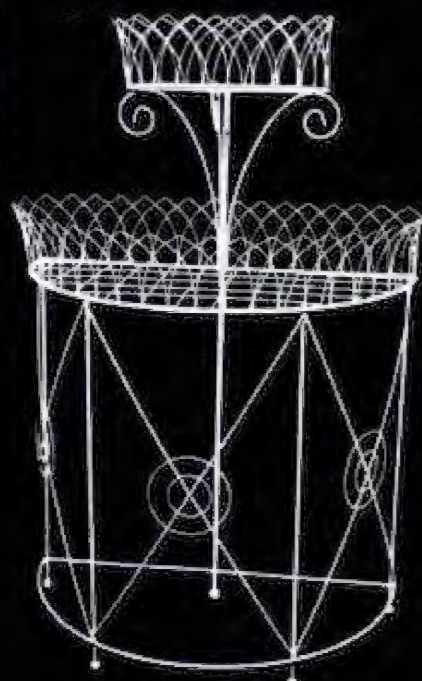
Left, Huncik inspects a row of wire cellos made for a department-store window display. His orders range from tiny wire baskets to giant Christmas wreaths for the Empire State Building or a 20-foot canopy

Heavy steel wire is bent in metal forms (below) to carry out the intricate designs Huncik is asked to make by an international clientele. Tools include spot welders, hacksaws, shears and assorted hammers





Here is a variety of Huncik creations: The ballet dancer was made for a department-store display; the garden chair at right and the table below it, which holds flower-pots, were also made for a display arrangement; the umbrella of wire makes a unique eye-catcher, and the big map of the U. S. was made for a bus terminal. Huncik combines fine art with craftsmanship to produce attractive display items and aids to interior decorators.





Outboards Distribute Fish Poison

Conservationists now are using outboard motors to distribute poison throughout lakes inhabited by undesirable rough fish. Lakes chosen for stocking with game fish sometimes support a large population of rough fish which would eat the fingerlings soon after they were placed in the water. Before stocking the lake, conservationists

poison the existing fish by distributing rotenone through the water. In one technique, a large burlap bag filled with poison is towed behind a boat at slow speed. The turbulence of the wake left by the outboard motor distributes the rotenone uniformly. In another method a large outboard is anchored in a few feet of water and the poison poured just in front of the propeller, which fans it out into the lake.

Tram-Rail Crane Rotates and Tilts Load As It Moves Along Track



Loads lifted on a new tram-rail-type crane can be rotated as well as tilted and moved along the bridge. The crane has a carrier that turns in either direction. The hairpin hook is designed to handle coiled material such as wire. It is inserted through the coils, tilted up slightly to prevent them from falling off, and then moved as desired. At the other end of the trip, the carrier is rotated until the stacks can be dropped in the correct position. The crane's open-type cab has glass flooring to give the operator a clear view in all directions.

¶ As protection for a national shrine, even the trees at George Washington's Mount Vernon home are guarded against lightning by wires running from the ground up the trunks to provide a good conducting path should they be struck.



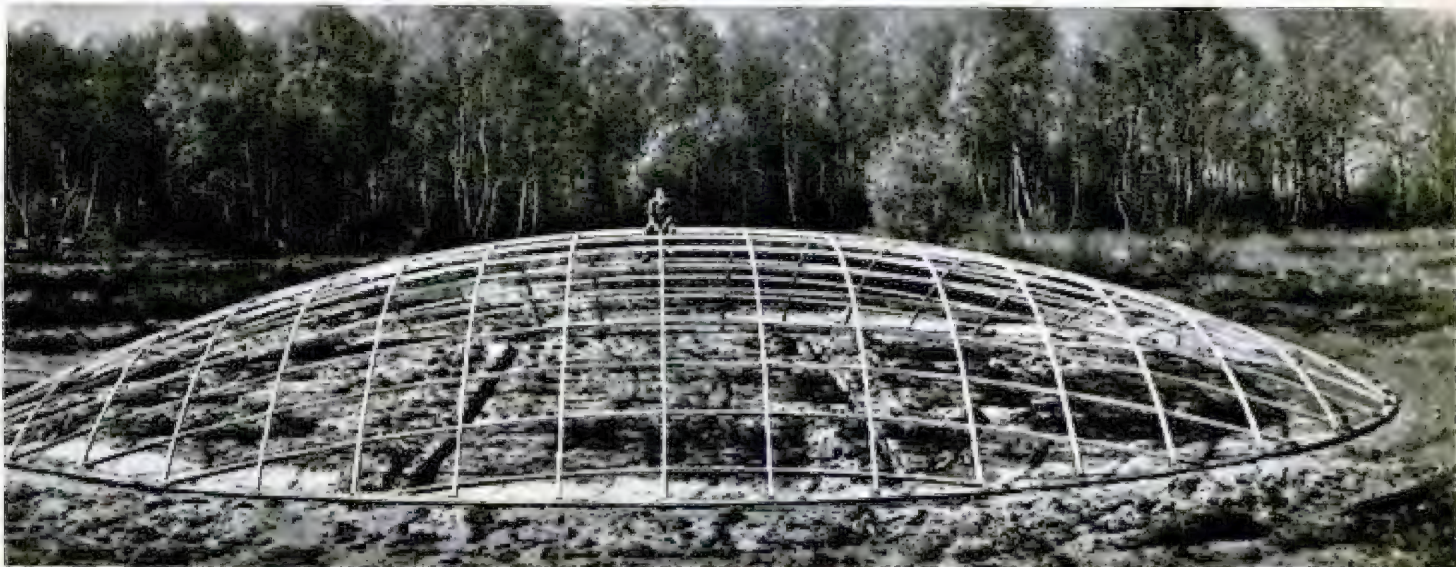
Left, ends of the framework members fit into sockets in the special shoes. Center, the shoes are welded to an outer support ring. Right, after the framework has been built, aluminum sheet is welded to cover it

"Mushroom" Roof Supports Itself

No supports are needed for a new aluminum roof developed in England. Designed to cover oil and chemical-storage tanks, the roof is held up by its own framework and is said to be as strong as a similar steel structure. An experimental model 83 feet in diameter was tested by covering it with bricks and taking vertical-deflection readings. Despite the load of 27 pounds per square foot, the deflection was negligible.

The framework for the roof was made of square aluminum tubing, curved to a radius of 100 feet. Tenon joints connect the tubes at all intersections. Shoes welded to an outer support ring hold the ends of the tubes. After the framework is built, aluminum sheet is welded in place to cover the structure. Aluminum roofs of this type are said to be capable of a span between 500 and 600 feet.

Completed framework is made of square aluminum tubing connected at all intersections with tenon joints



Roof is tested by covering it with bricks. A load of 27 pounds per square foot produces little deflection





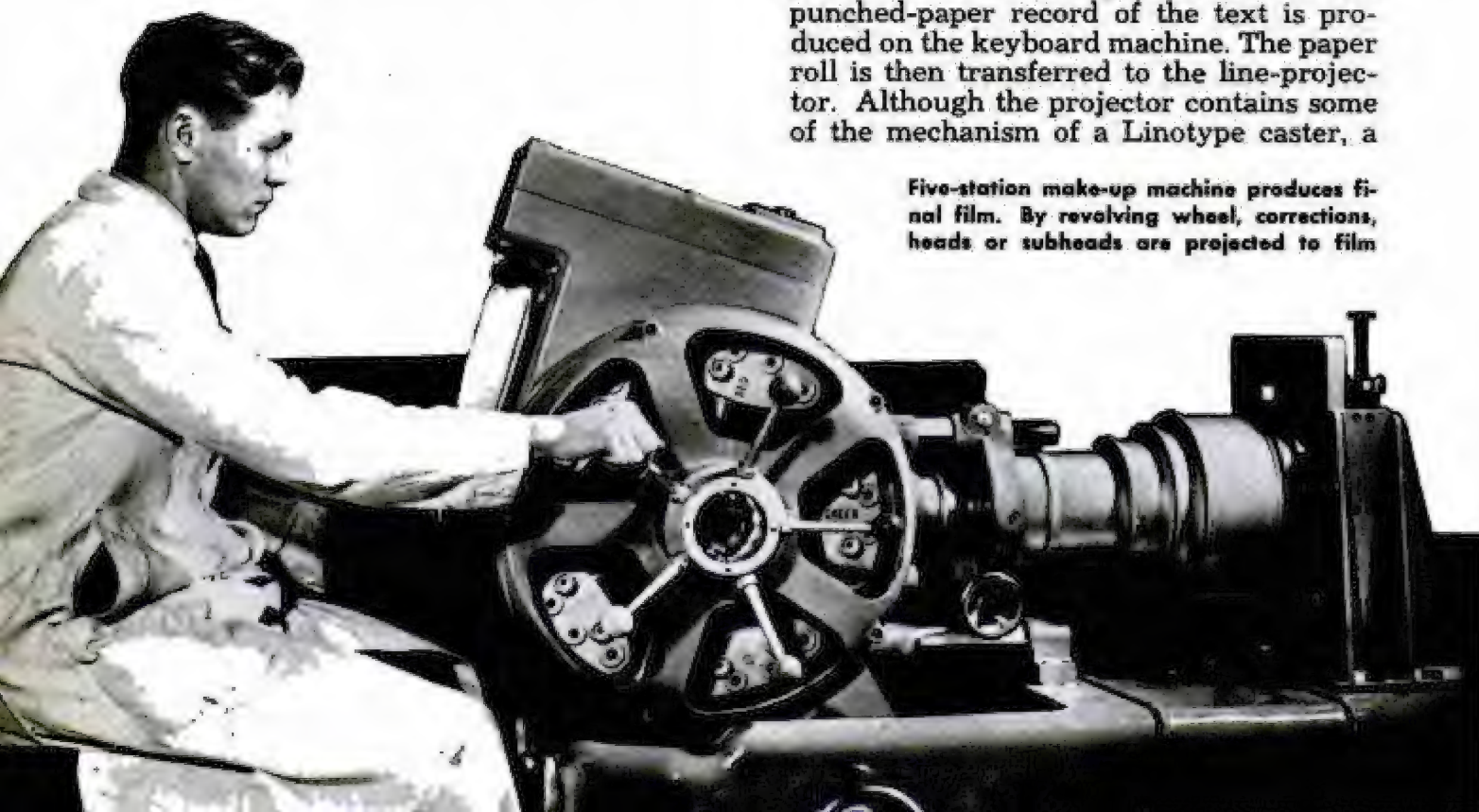
Rotofoto typesetting system starts by making a punched-paper record of the text (right) on keyboard machine

Setting Type With a Camera

EVERY hundred years or so some inventor finds a new way of setting type. Gutenberg invented movable type back in 1450 and Mergenthaler perfected the intricate Linotype in 1885. Recently, an Englishman, George Westover, came up with a process involving three machines which sets type by photography. While the Linotype produces castings for each line of type in metal, Westover's automatic system, called Rotofoto, produces positives or negatives of each line without the setting of any metal type.

The Rotofoto equipment has three main components: the keyboard (which resembles that of the Linotype), the line-projector and the make-up machine. First, a punched-paper record of the text is produced on the keyboard machine. The paper roll is then transferred to the line-projector. Although the projector contains some of the mechanism of a Linotype caster, a

Five-station make-up machine produces final film. By revolving wheel, corrections, heads or subheads are projected to film





The line-projector is used in second step to transfer punched-paper record onto film, one letter at a time

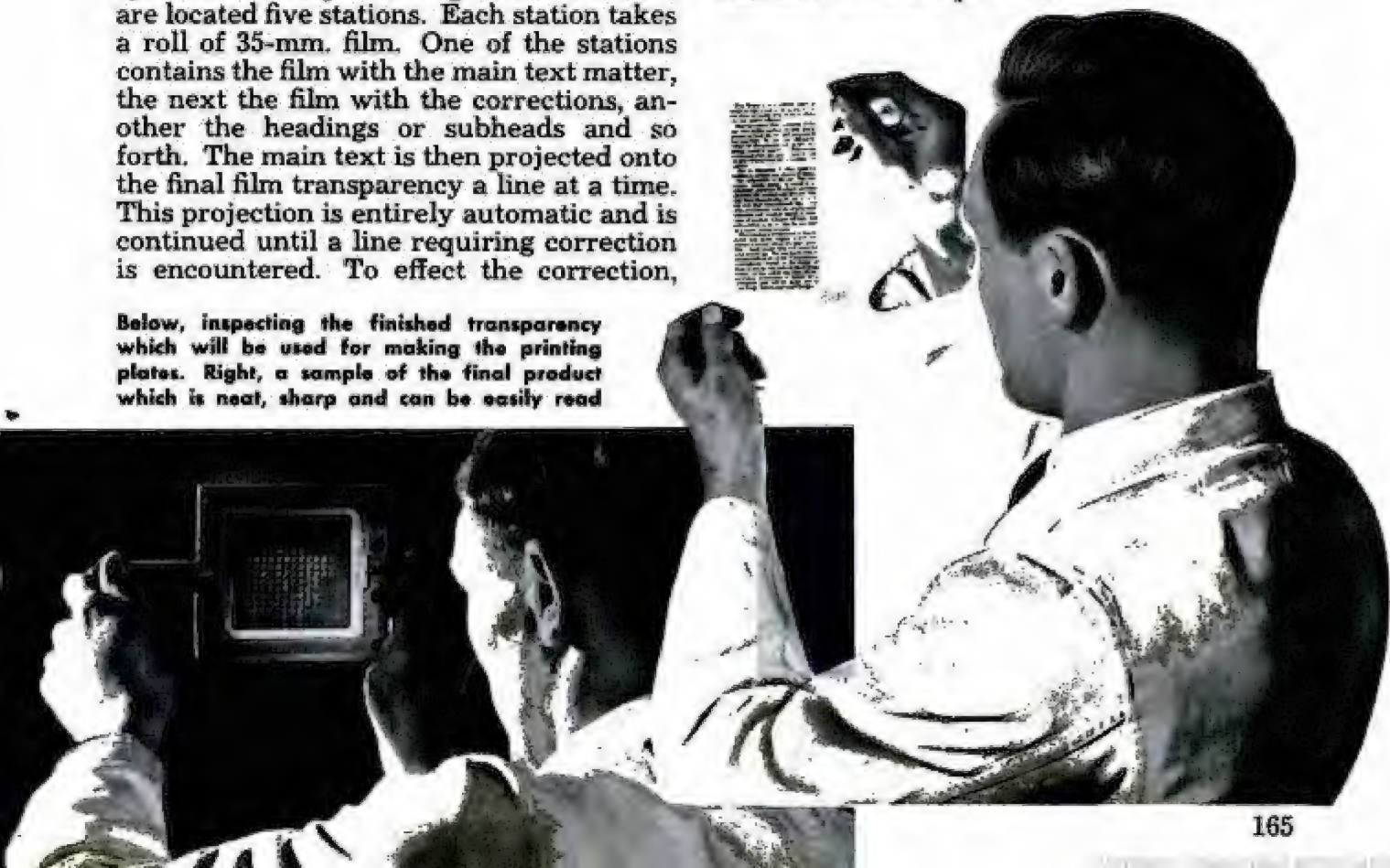
photographic negative is substituted for the bronze matrix. The letters are photographed, one by one, on a roll of 35-mm. film carried in a camera. After developing, a photographic image of the lines appears on the film. Proofs are produced by projecting the film onto a roll of sensitized paper. Any line containing a correction is retapped on the keyboard and reset on the projector. All corrections appear on one or more separate rolls of film.

The last process is carried out on the make-up machine which consists of a cylindrical lamp housing around which are located five stations. Each station takes a roll of 35-mm. film. One of the stations contains the film with the main text matter, the next the film with the corrections, another the headings or subheads and so forth. The main text is then projected onto the final film transparency a line at a time. This projection is entirely automatic and is continued until a line requiring correction is encountered. To effect the correction,

the film holder is revolved and the corrected line is projected onto the transparency. When this is completed the holder is turned back to the main text to resume projection. Finally, the transparencies are used for making the printing plates and the printing process begins.

Westover cites these advantages of his Rotofoto system: eliminates metal type, makes possible the changing of type size by simple magnification, saves storage space (a book text is contained in a few narrow rolls of film) and produces a highly readable finished product.

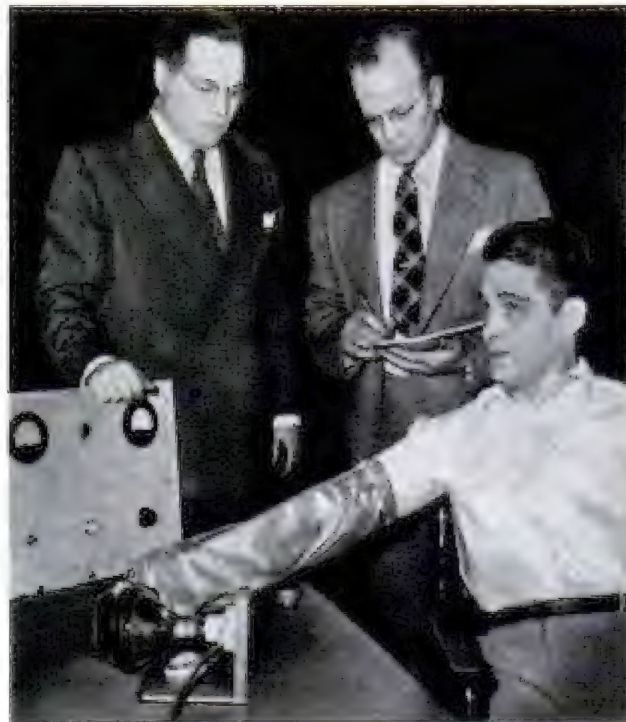
Below, inspecting the finished transparency which will be used for making the printing plates. Right, a sample of the final product which is neat, sharp and can be easily read





Rate Controller Speeds Reading

By forcing a person to read faster, a mechanical controller increases his reading rate. The machine, designed by Dr. Guy T. Buswell of the University of Chicago, has consistently raised the reading rate of grammar-school students, Army personnel and others. An aluminum screen which moves down, line by line, covers up the reading material at a controlled rate of speed. As the reader increases his rate, he gradually accelerates the movements of the screen. Students at the Air Command and Staff School, Maxwell Field, Ala., showed a 100-percent increase after a six-week course in using the controller.



Aluminum-Plastic Cloth

Ordinary bed sheets, when coated with a special paint, become as warm as heavy woolen blankets, according to the inventor. He has also developed a cloth for lightweight winter garments that may revolutionize the clothing industry. Both the cloth and paint keep the wearer warm by reflecting the radiant heat of the body. The cloth is made from powdered aluminum with a Vinylite-plastic base. It can be made to sell for about one tenth the cost of woolen material. Tests made with a special mechanical sleeve have proved that the new cloth has an extraordinary ability to reflect back the heat generated by the body.

Midget Greenhouses Made of Glass Protect Tomato Plants



Tiny greenhouses, made by cutting the bottoms off glass jugs, protect tender tomato plants from damaging frosts in the garden of D. J. Palumbo of Dunmore, Pa. Stoppers are removed from the jugs to permit the circulation of air around the plants. By using these jugs, Palumbo can set out his plants early in the season.

Stainless steel has permitted industrial designers to reduce the weight of a modern railroad passenger car as much as 25 tons.



Billions of particles from this smoke generator can trick cloud vapor into freezing, creating a snowstorm

Weather a la Carte

By Clifford B. Hicks

WHEN Vincent Schaefer dropped a few pellets of Dry Ice from an airplane to spill his first cloud in November, 1946, he triggered more than a first-rate snowstorm. The General Electric scientist touched off a research program that now is unlocking some of Nature's basic weather secrets and may give man the audacity to tamper with the daily weather.

Schaefer and his fellow scientists have been quietly skywriting weather history for the past two and one half years. After tapping the secret of making rain, they decided to penetrate the fog that shrouds Nature's own weather processes. They had, they believed, attacked the problem backward. While they could cause rain to fall, they did not know just how Nature

herself pulled the trigger on a rainstorm.

Recently through their research program they have come up with information less spectacular than rain making but data

This "racetrack in the clouds" was formed by seeding with Dry Ice. The straightaways are 20 miles long. The cloud vapor has frozen and fallen

U. S. Signal Corps photo



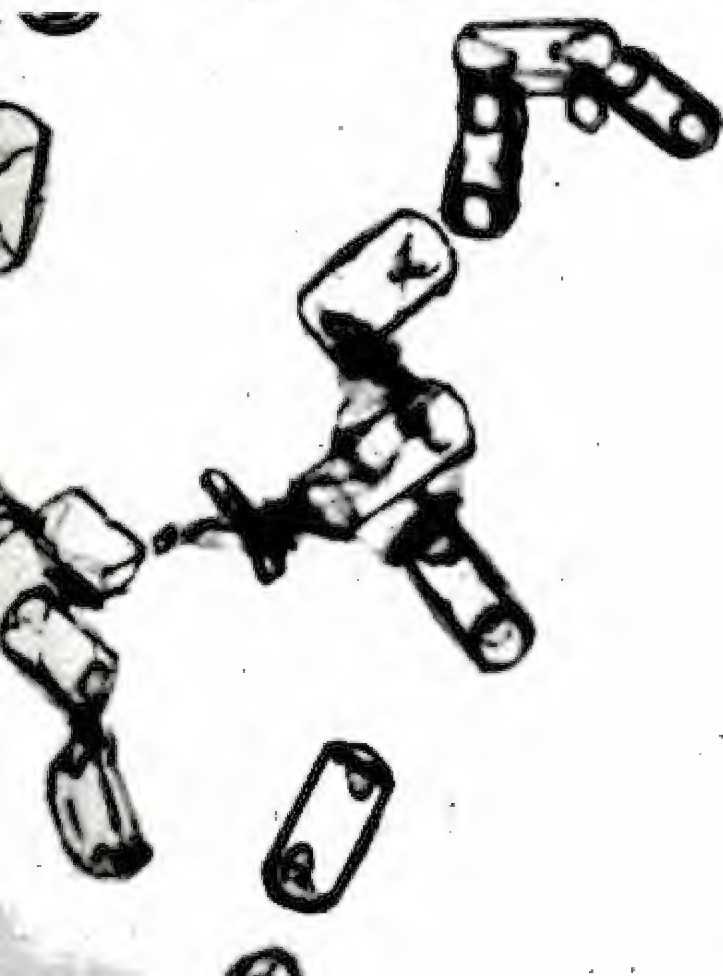
which throws significant light on natural weather processes. They also are making some sparkling new suggestions on how to use this basic weather knowledge and how to apply older principles of rain making.

One of Schaefer's ideas is that man can steal the thunder from electrical storms by scattering thunderheads before they become dangerous. The U. S. Forest Service cooperated with him last summer in testing this idea at the Priest River Experimental Forest in Idaho.

The Forest Service is vitally interested in the suggestion because a large number of destructive forest fires are touched off by lightning. And what causes lightning? No one knows for sure, but Schaefer believes that when a large cloud supercools to a high degree it packs up such a wallop of energy that an electrical storm is the result. If man can control supercooled clouds, why can't he control lightning and the particular supercooled clouds which produce hail and severe cloudbursts?

H. T. Gisborne, Chief of the Division of Fire Research, is in charge of the Forest Service's part of the experiments. Only when weather conditions produce two similar clouds of the necessary type is he making the dissipating tests. Thus one cloud can be treated while the other is observed as to what would have happened if the target cloud had not been altered.

COLUMNAR snow crystals are tailor-made by introducing acetone vapor into laboratory cold chamber



In their experiments Schaefer and Gisborne are using a needle-sharp instrument in series with a micro-ammeter to measure atmospheric electricity in a lightning storm in the same way an electrocardiograph measures electric potential in the heart. As Gisborne puts it, "We seem to be getting the pulse beats of a lightning storm but we can't interpret the significance of all the pen deflections yet. It seems to me that our knowledge of these pen deflections is just about comparable to that of the doctors 30 years ago when they first applied an electrocardiograph to a human being. When we can interpret those deflections we should be able to rate the intensity of violence or menace of each lightning storm."

The plan for dissipating a thunderhead differs from ordinary rain making. The objective is to turn the water droplets of the cloud into fine snow that will fuzz out and drift away. This is accomplished by over-seeding the cloud.

Gisborne emphasizes that clouds must be of the right type. In fact, he feels that the phrase "triggering a cloud" is a lucky choice of words because you can trigger an unloaded gun forever with no results; in the same way, some clouds are "loaded" for rain making or lightning dissipation and some aren't.

Take a look now at how Schaefer's team

HEXAGONAL crystals are usual type formed in the laboratory. Now they can be converted to other types





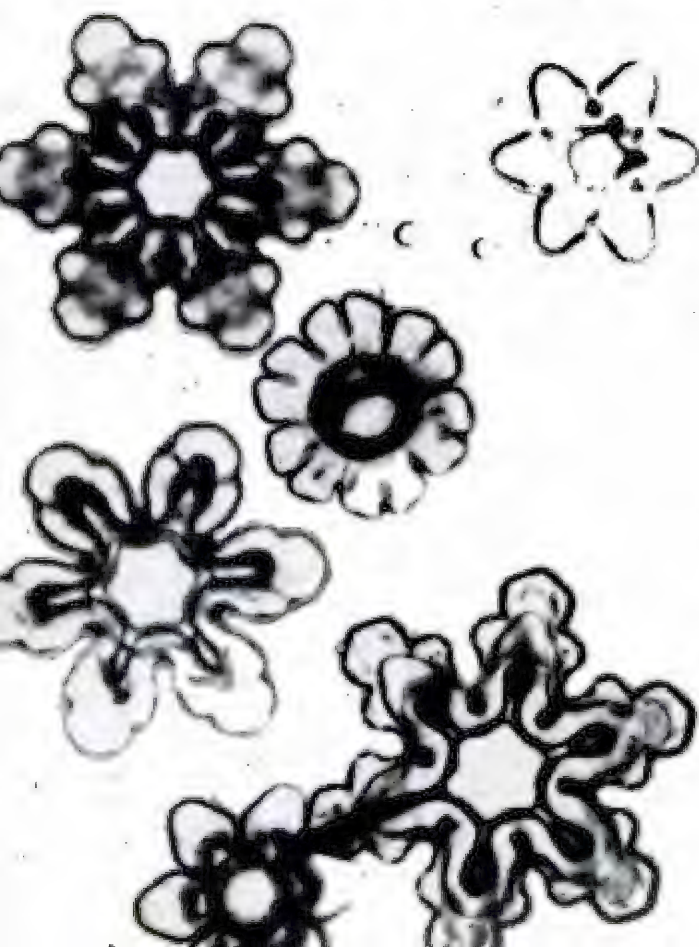
Snowflakes that won't melt: Schaefer captures the shape of individual flakes by dropping the crystals into a plastic solution. Solvent eventually evaporates, leaving plastic shell which is a replica of the snowflake

is ferreting out Nature's basic secrets.

Latest of the successful research programs is the work in waterdrops. What is the nature of a waterdrop? The question seems so simple that apparently science overlooked it until the General Electric team decided to find out just how a raindrop behaves.

Surprisingly, they found that a water-

STELLAR crystals are produced by use of acetic acid. Vapors in atmosphere may change natural snowflakes



drop is not tear-shaped, and neither would a tear be if it fell farther than the end of your nose. Raindrops change shape as many as 50 times per second and in the course of a fall they may resemble a pancake, peanut, jellybean, duck, hot dog, telephone receiver, caterpillar, or even your foot.

Most raindrops which break up first are transformed into a variety of shapes but eventually look like a dumbbell with two bulging ends. In the tests, 89 percent of such drops broke at the neck to form two separate drops, with the neck splitting off into a third smaller drop. In eight percent of the tests the drops exploded or shattered.

The information gives the weather scientists insight into what happens after a cloud is triggered, either by Nature or by man. Each drop may grow by accretion, split into smaller drops and then repeat the same cycle again.

G. E. scientists developed an ingenious instrument known as a drop controller to make these tests. The instrument, similar to a vertical wind tunnel, blows an upward current of air against a drop of water. By regulating the current, the observer is able to hang the drop in mid-air for periods of several minutes, watching and photographing it as it undergoes transformation.

The scientists also are probing the phenomena of supercooling. They recently succeeded in supercooling water 71 degrees below its ordinary freezing point before it turned into ice. Such research may show how Nature supercools rainclouds and then triggers them with natural nuclei. The scientists report that they have made "clouds" of supercooled gallium, tin



Series of pictures show how a rainstorm was created artificially. Scientists now propose that when a landing field is closed in by supercooled fog or rain clouds, the aviator could dissipate them within a few minutes. Photo above shows the cloud before treatment



Above, this picture was taken immediately after the cloud was seeded with Dry Ice. Note how some parts already are fuzzing out into precipitation. Photo below was made during the rainstorm that followed. Overseeding can produce tiny ice crystals that drift away



and mercury by dispersing these metals in liquid form as minute droplets suspended in oil. Although the droplets may contain nuclei, the freezing that begins in the liquid metal can't spread through the oil and thus can't precipitate the rest of the "metal cloud."

How about the structure of a snowflake? As a result of recent studies, Schaefer not only can produce his own snow but can choose the particular brand of flakes he desires. He can change a snow crystal from one shape to another merely by introducing foreign vapors into the cold chamber. Under ordinary conditions cold-chamber snow crystals are hexagonal. By introducing butyl-alcohol vapor in small quantities, Schaefer can change them into columns and prisms. Other vapors produce other snow families such as ice needles, triangular plates, capped columns and freak forms. As vapors are present in the atmosphere, this may be one of the answers to the riddle of how Nature shapes snow crystals.

Schaefer has developed a unique system for preserving snowflakes indefinitely. He blankets the desired flake with a solution of Formvar, a transparent plastic resin. When the solvent evaporates, the snowflake is encased in a hard shell that will preserve the shape of the crystal for an indefinite time.

An instrument recently developed by the weather scientists "fingerprints" a snowstorm. Falling flakes strike the instrument's dye-coated paper. A small amount of heat melts the flakes immediately, leaving dark blue impressions on the paper. The strip is exposed for one minute at 15-minute intervals. When the storm is over, the paper shows how big the flakes were, what kind they were, how many fell in a given area and how long the storm lasted.

Through their laboratory

research work, the G.E. scientists now know that, given the proper kind of cloud, they can drum up a shower or snowstorm in four different ways: by sowing Dry Ice through the cloud; by flooding the cloud with billions of foreign nuclei, each capable of growing into a snowflake; by simply dropping water into the top of one kind of cloud; and by the sudden expansion of air within a cloud.

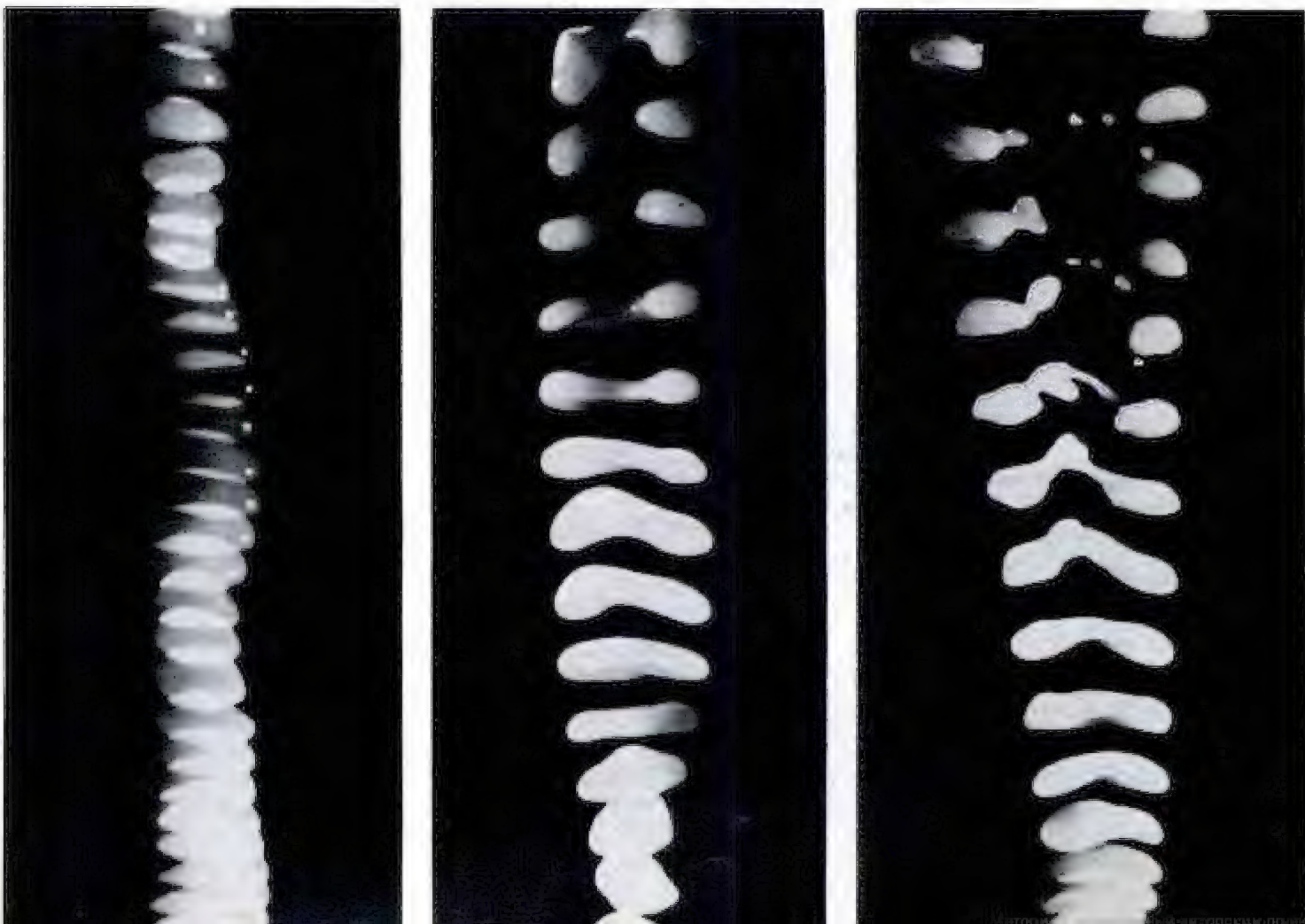
Dr. Bernard Vonnegut, one of the youngest scientists in the project, felt for some time that a supercooled cloud could be transformed into a swirling snowstorm by loaning the cloud billions of particles which would trick the water vapor into gathering and freezing into flakes. He succeeded in producing a laboratory snowstorm with silver iodide, which is practically a twin of ice in crystal dimensions.



Scientists watch as a single drop of water hovers in air. Controller blows air up against the drop, suspending it so its development can be studied

Vonnegut then came up with a generator for broadcasting the particles. The machine, which burns charcoal impregnated with silver iodide, cooks up a hundred million million particles per second. The scientists have calculated that a system of generators spaced 20 miles apart across the country would be able to sow a silver

Photographic record shows various drops as they undergo change. The test reverses normal direction as drops fall "up" from force of air. Left drop maintains shape, center drop splits, and right one splits and shatters





Schaefer examines point of instrument used with a micro-ammeter to make "electrocardiogram" of storm

lining into every supercooled cloud above the United States. Many such clouds could be precipitated, increasing the amount of sunlight reaching the ground and thereby raising the winter temperature.

Dr. Irving Langmuir has made the surprising statement that it's possible to squirt an eye dropper of water into the top of the proper kind of cloud (not even a supercooled one) and the cloud will col-

This instrument "fingerprints" a snowstorm by recording the shape, size and frequency of fall of flakes



lapse into a rainstorm. Here's the kind of a cloud you will need to turn this fascinating trick: a fairly common type of cumulus cloud five thousand feet thick or more with fairly large cloud droplets and an updraft of at least five miles an hour.

When you squirt a large drop of water into the top, it starts falling through the cloud, collides with smaller droplets and grows to a critical size when surface tension no longer can hold it together. At this point it splits into smaller drops, and, being lighter, they are carried aloft again by the updraft until they grow large enough to fall once more. This spreads into a chain reaction until all the water is in drops too heavy to stay aloft and the cloud collapses.

This theory has been proved under natural conditions. It is significant to note that this type of nonsupercooled cumulus cloud is fairly common over the United States throughout the summer.

Vonnegut squeezes still another type of cloud trigger in the laboratory. He uncaps a bottle of soda water or bursts a toy balloon inside the chamber. The sudden expansion of air produces a sharp drop in the temperature, causing the water vapor to form into millions of ice nuclei, the nuclei grow and presto—you have a man-made snowstorm.

According to the scientists, these four triggers—Dry Ice, artificial nuclei, water and the expansion of air—can be pulled in a fascinating number of ways to affect man's environment. If a cloud is overseeded, it will turn into billions of ice crystals, thus preventing rain—a technique that might be a potent military weapon. Under the right conditions, clouds could be dissipated until crops are harvested. Or some of the numerous clouds on the west side of the Rockies, converted to crystals, would float across the mountains under the proper wind condition.

There also may be experiments to trigger snowstorms across the countryside before the clouds drift over cities. Farmers often need snow, but city folk don't like to shovel it. New York's annual snow removal bill is about seven million dollars.

Rockets have been proposed by Schaefer to dissipate the supercooled fog around airports. They would climb above the fog and explode into a curtain of Dry Ice pellets that would trigger the murk into a snowfall lasting only a short time. Behold—a clear airfield. Successive upwind treatments would keep the airfield clear.

These are not the idle dreams of men with their heads in the clouds. Each of these schemes has been proved possible in the laboratory, and many such experiments have been successfully performed under natural conditions.



Holder for Handbags

Handbags and umbrellas can be hung from the edge of any shelf on a portable holder small enough to fit into the purse. The holder rests over the edge of the shelf with the hook dangling beneath. A rubber pad on the holder prevents it from marring the surface.

Film in Rocket Will Photograph Ultraviolet Rays of the Sun

Rockets sent high into the atmosphere may soon carry a new photographic emulsion that is sensitive to light far into the ultraviolet as scientists seek more information about the sun. Developed for identifying atoms or chemicals by analyzing their radiant energies, the emulsion has extremely close-packed silver grains with very little gelatin. Being supersensitive to ultraviolet rays, the emulsion will photograph accurately the sun's rays at extremely high altitudes where ultraviolet rays are intense because there is little atmosphere to filter them.

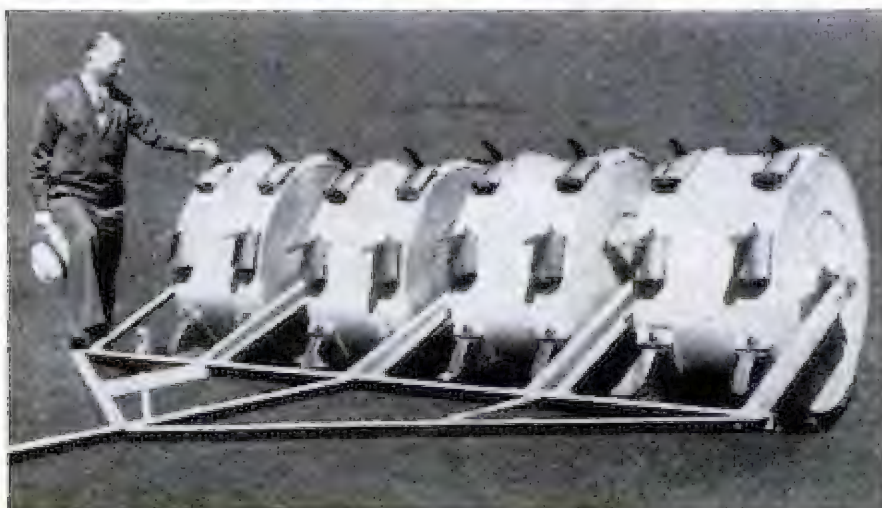


Major inspects the squirter that quieted his bark. At night, the nozzle is placed inside the doghouse

Electronic Shower Quiets Dog

When his pet dog, Major, insisted on barking at 4:30 every morning, W. J. McGoldrick of Minneapolis decided something had to be done to stop the sleep-disturbing habit. Being an engineer, he solved the problem electronically with an automatic device that squirts an annoying stream of water in the dog's face whenever he barks. An amplifying circuit picks up the sound of the bark and turns on the water. When the barking stops so does the water. In a few nights, Major learned how to keep from being soaked, and now McGoldrick and the neighbors sleep without any disturbance from the dog.

Roller Punches Holes in Ground to Prevent Erosion by Rainfall



Punching thousands of holes in the soil prevents erosion by absorbing rainfall before it can carry off topsoil, according to Homer K. Shonts, a Washington wheat farmer who invented a machine that digs 28,000 holes per acre. The machine is a heavy roller composed of four sections. Two rows of steel teeth on each section dig into the ground, punching pores in the soil.



To stretch-wrap bottle cap, the film is placed in an embroidery hoop and warmed over a candle. Then the cap end of bottle is thrust into film and given a twist. Below, Goodyear Pliofilm holds margarine

Seal It With Rubber

By Walter E. Burton

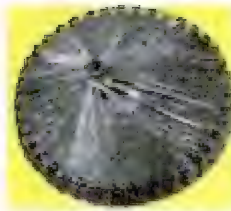
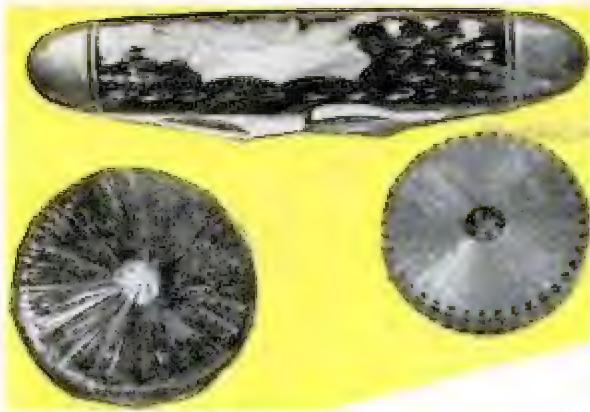
A WARTIME office worker aroused the envy of the other employees each noon with a lunch that included oven-fresh pie and sandwiches containing unwilted lettuce and bread that lacked the customary air-hardened shell. The secret, the other workers eventually learned, was a sheet of flexible, transparent film.

"Where do you buy it?" they all asked; but in that period of shortages none of the magic film could be found. Still, the office worker, month after month, kept appearing with a film-fresh lunch using the same wrapping over and over. The film was washed each evening and dried.

That film happened to be made of rubber hydrochloride, a chemically altered form of crude rubber. Marketed under the name of Pliofilm, it is, today—along with other varieties of film wrapping materials—available for wrapping lunches or otherwise making life more pleasant and economical.

The "age of films" is here. There are more trade names and sub-varieties than a quartet can count on its fingers and toes. In general, "film" of this type is a plastic sheet about .00075 to .025 inch thick. Films





Hundreds of items such as knives, wire brushes and small gears are wrapped in Pliofilm to prevent rust

are made of many different materials. Cellulose nitrate was one of the first forms. Its brother, cellulose acetate, is familiar to millions as the film part of safety-base photographic films. In various thicknesses it is being used for packaging and similar applications. Another form is cellulose acetate butyrate. A relative old-timer is transparent cellulose film. Rubber derivatives, obtained by chemically altering crude rubber, form another source of films. Vinyl resins provide an important assortment, such as films made from plasticized polyvinyl chloride. Vinylidene chloride is still another film material. There are numerous others.

The names of these magic films do not necessarily represent single packaging materials, but instead may denote whole families of materials having wide ranges of properties. In order to assure the best results, a film should be selected or made specifically for a certain purpose.

One day early in October of last year, I wrapped several apples individually in Pliofilm (rubber hydrochloride), sealed them here and there (but not enough to

make the wrapping air-tight) with cellulose tape, and placed them in a refrigerator. From time to time during the next several weeks I would take out an apple and eat it. But one big, red Delicious specimen found its way back into a corner where it successfully hid every time I was apple-hunting. Towards the end of June someone reminded me that there still was an apple in the refrigerator. Assuming that it would be spoiled after nearly nine months in the cooler, I tore off the wrapping and found, not a shriveled, rot-pitted apple, but one as firm and fresh-looking as the day it was placed in its film jacket. It tasted even better than it looked!

This is a small-scale example of what has been going on for several years in the apple industry. The Goodyear Tire & Rubber Company has been supporting, at the University of Iowa, a research program aimed at finding the best ways of wrapping apples so they can be stored longer, shipped farther, and kept more free than unwrapped fruit of such ailments as dry rot, Jonathan spot and shriveling.

Each kind of apple, it was found, reacts

Tests at Iowa State College show that Pliofilm-protected apples (left) are in good condition after storage for six months. Apples at right were picked from same tree and kept under like conditions but in paper liner





The shine on these oranges is from their transparent "second skin" of Pliofilm which retains true freshness of fruit. The machine can wrap 800 a minute. Below, barbecue sauce is canned in Pliofilm bag



differently when packaged in film; and apples of one kind but from different localities behave in different ways. Jonathan apples from the West Coast have been packaged successfully in Pliofilm, and oranges are being preserved in a similar way.

Keeping an apple or any other "living" material in a film wrapper may not be as simple as it appears. Even though an apple, peach, ear of corn, or any other fresh fruit or vegetable has been detached from the plant that produced it, it still is a living organism that undergoes a chemical change known as catabolism. This process, which causes fruit to ripen after picking, requires oxygen and consumes energy stored in the fruit itself, and it produces carbon-dioxide gas.

By slowing the catabolic process, food can be kept almost in a state of suspended animation, and its eventual spoilage postponed considerably. This slow-down can be accomplished in two steps: (1) By wrapping the fruit or vegetable in a protective film

having suitable properties or by placing it with others of its kind in a container lined or wrapped with the film. (2) By storing the package or wrapped pieces of food at a low (but not freezing) temperature.

The wrapping must allow the fruit or vegetable to "breathe." That is, some oxygen must be permitted to reach it, and some of the carbon-dioxide gas it generates must be allowed to escape. At the same time, to prevent shriveling, the escape of water vapor must be discouraged. Too much CO_2 will smother the fruit, too little will permit decay. If the fruit is simply wrapped and kept at ordinary temperatures, spoilage may be delayed a while, but fungi and bacteria will get in their work too soon. By refrigerating the wrapped or packaged fruit, usually at a temperature such as 36 to 38 degrees Fahrenheit, action of these decay organisms is arrested.

Food products that do not have to breathe can be packaged in gas-tight film and the seams sealed tightly. Cheese, meats, dried vegetables, cooked foods, soups and oils are among the things that can be preserved in this way. Here, again, temperature may have to be lowered to prevent molding or other spoilage. Red meat has been a problem. When wrapped in transparent film (which must be uncolored), meat gradually darkens. It is thought that this is a result of light action in which oxygen is involved. Research has been done in an attempt to develop a film that will preserve red meat without allowing it to discolor. Another problem with some kinds of meat is the accumulation of a slimy

(Continued to page 256)



Nonmoistureproof Cellophane is used to make dustproof covers for laboratory glasses. It is first soaked in water, then held with rubber bands



Paintbrush is kept from drying out in Pliofilm bag. If storage is for a few days, paint is left in bristles; if for a long period a thinner should be added. Below, film seals the cap on a film-splicing cement bottle



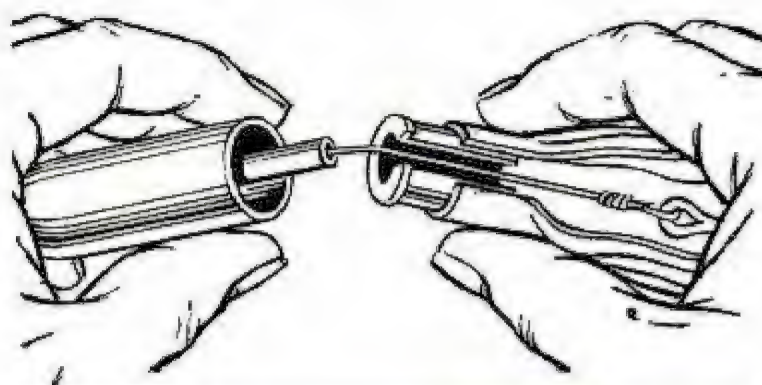
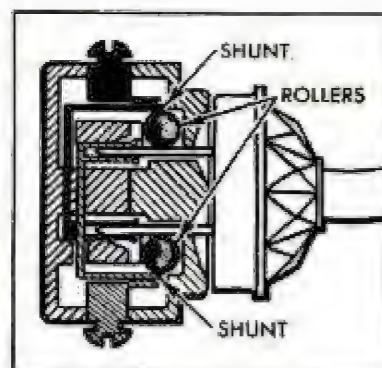


Dolly and Jack Team Up To Change Truck Tires

Changing tires on a heavy truck is an effortless operation with a jack and dolly combination that eliminates lifting the wheels. The wheel is driven up on the dolly, which rolls on a track extending from the base of the hydraulic jack. When the axle has been raised by the jack, the lugs are removed and the wheel slides off the axle as the dolly is pulled forward on the track. The wheel is then rolled off the dolly and the spare wheel rolled up in its place. When the dolly is pushed back under the axle, the wheel can be rotated on rollers in the cradle to line up with the lug bolts. The axle can be jacked up first and the dolly swung under the wheel after the tire is off the ground.

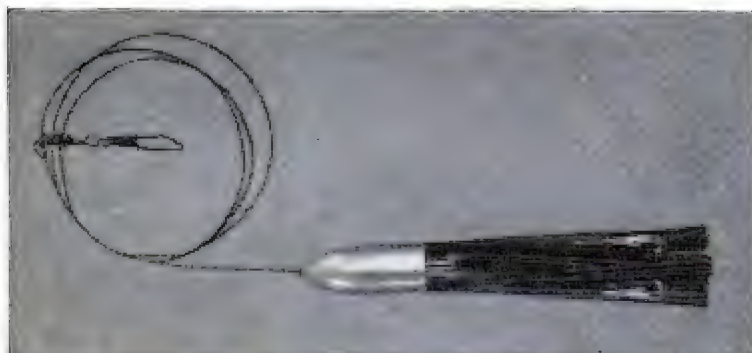
Safety Electric Outlet Won't Shock Probing Children

Accidental shocks to curious children are almost impossible in an electric outlet which is not energized until both prongs of a plug are inserted. Four insulated rollers in the socket complete the circuit when forced aside by the prongs, pushing two shunts against live contacts. Since the top rollers complete the lower circuit, there is no shock when an object is forced into one of them.



Snap-On Trolling Lure

Plastic "skirts" of various colors snap onto the head of a new trolling lure, making it possible to change baits within a few seconds. The skirt is slotted and fastens to the leader simply by pinching one end and inserting it into the head. Spring action snaps it into position. Thus, only the skirt need be changed when a lure is damaged or when the fisherman decides to try a new color combination to tempt the fish.



Because summer temperatures soar up to 130 degrees in the shade and the cold winds of winter are almost unbearable, the miners at Coober Pedy, Australia, the richest known opal field in the world, live and work in a complete underground town.

No-Dip Paintbrush

Painters can work without dipping their brush with an outfit that feeds paint directly into the bristles. The paint is gravity-fed from a bucket through a flexible hose and into the base of the bristles. A cutoff clip on the hose gives the painter control of the flow. During overhead work, the painter squeezes an impulse bulb which forces paint up the hose and into the brush.



Chemicals From Stumps

Pine-tree stumps, once considered worthless and bothersome, now are providing millions of dollars worth of rosin, turpentine and pine oil. A new process recovers about 400 pounds of these products from a ton of stump wood. The stumps are rooted out by special tractors, split into small pieces, cleaned by water jets and shredded into particles

the size of sawdust. A high-temperature solvent then penetrates the particles to bring out the turpentine and other oils.



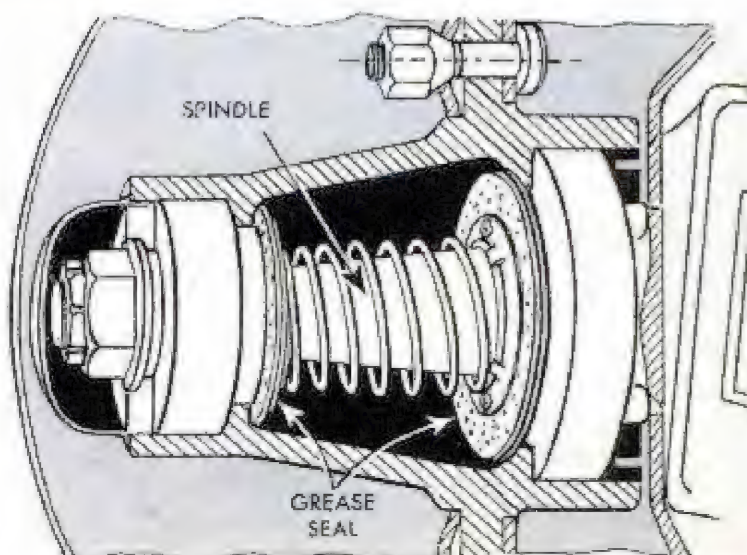
Tiny Plane Has Extra Handle

Only 3¼ inches long, a pocket-size plane has an extension handle that fits the palm of the hand to provide a sure grip. The little plane is designed for fitting and finishing work. Although it is only 1¼ inches wide, the tool is built for heavy use. It has a blade of tool steel specially treated to hold its edge. The extension handle fits on the rear of the plane and provides a maximum of leverage when pressed by the heel of the hand. Both the midget plane and the handle can be slipped into the pocket when the tool is not in use.

Front-Wheel Grease Seals

Front-wheel bearings of automobiles need attention less frequently, yet are assured of proper lubrication, when inside grease seals are used. The leather seals, held snugly against the inner and outer bearings by a coil spring, keep the grease where it is needed in the bearings. The complete seal unit revolves with the wheel. One model fits almost all makes of cars in use today.

☛ About 567 billion gallons of water are required annually to supply the needs of U. S. railroads.





'Round-the-Clock Fighter

High-altitude interception, night or day and in any kind of weather, is the work cut out for the Air Force's new Lockheed F-94 jet fighter. A second flyer in a cockpit behind the pilot operates radar that permits

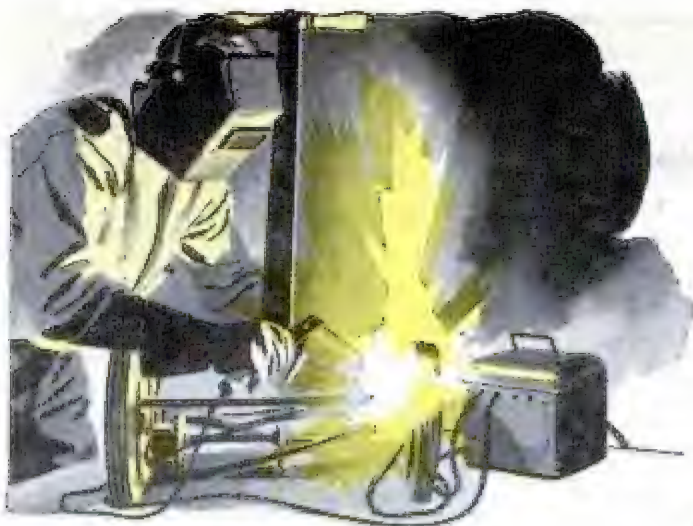
location and interception of enemy aircraft, even under completely blind flying conditions. The plane is in the 600-mile-an-hour class. Using a new technique of "afterburning," the plane provides added power by spraying fuel into the path of hot exhaust gases from the jet engine.



Rubber Lifeboat Inflates Itself

Inflating itself automatically when a ripcord is pulled, a rubber lifeboat sheds its carrying case and rights itself without taking on any water. Within 30 seconds of the time the ripcord is pulled, the boat is ready for use. It will accommodate 12 persons inside and has handrails alongside for 13

others. Inflated by carbon-dioxide cylinders, the two tubes that form the sides of the boat are divided into compartments for greater safety. The complete weight, including emergency rations and equipment, is only 186 pounds. Four paddles are included, two of which can be used as masts to support a cover. Equipment includes a signal kit, fishing tackle and sea markers.



ARC WELDING



HEATING MAINTENANCE

The Craftsman

★ High-efficiency airfoil of the special hook-sail rig combines with sensitive jib-sail steering to give "Scoot" something new in iceboat performance. A detailed construction story begins on page 190

★ The series on home maintenance continues with a discussion of heating-plant servicing and repair. Feature on page 210 tells how the average homeowner can get the most from his heating system

★ Beginning on page 230 a practical shop feature in two parts authoritatively covers both theory and practice of arc welding—a thorough-going reference work for beginners and weld shops



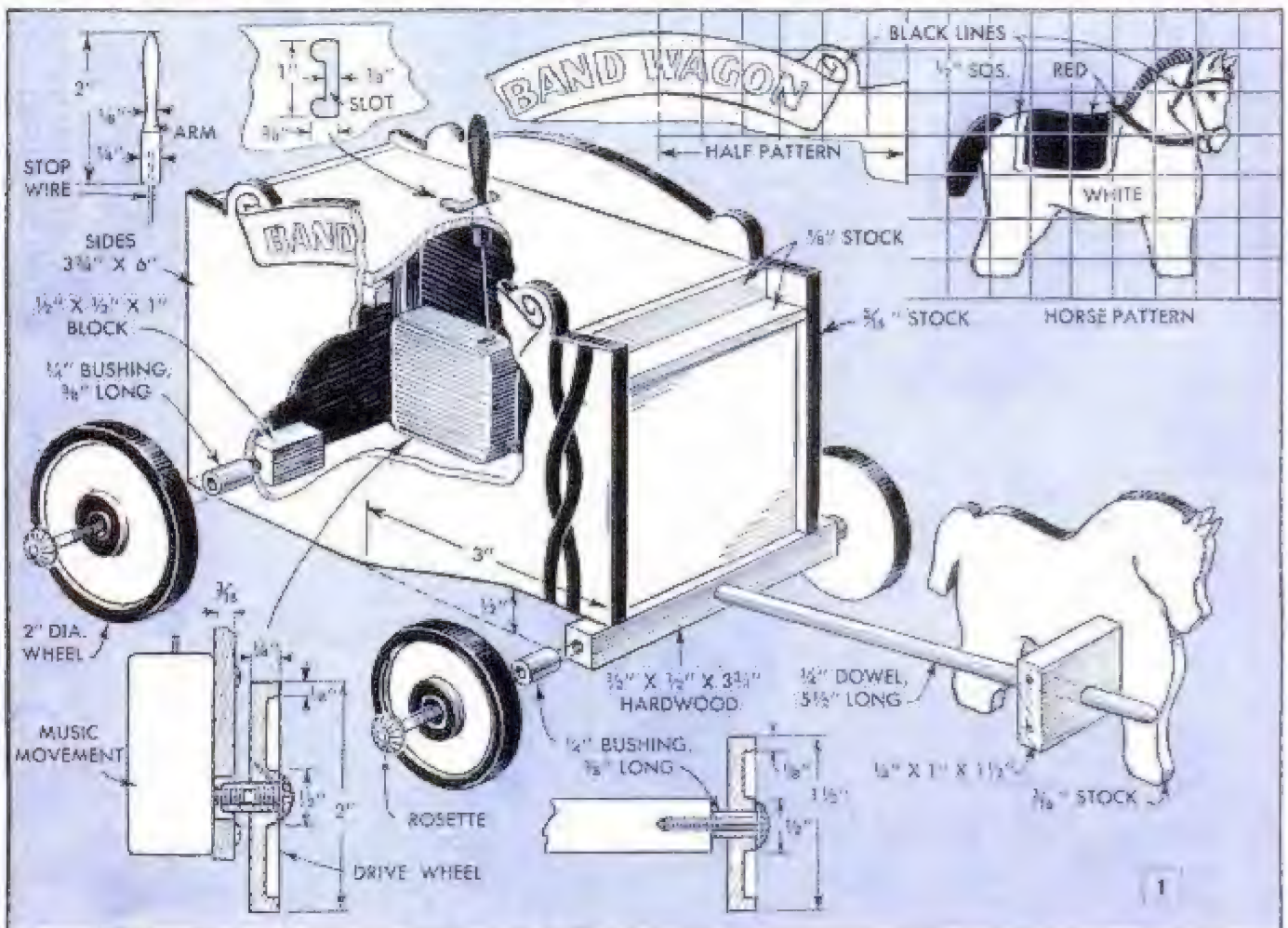
"SCOOT"—RUDDERLESS ICEBOAT

MUSICAL



THE BAND WAGON

Not only does the spring movement provide music for this little circus band wagon, but it propels it slowly as the spring unwinds. The rear doors on the wagon are represented by merely ruling lines on the wood



NOVELTIES

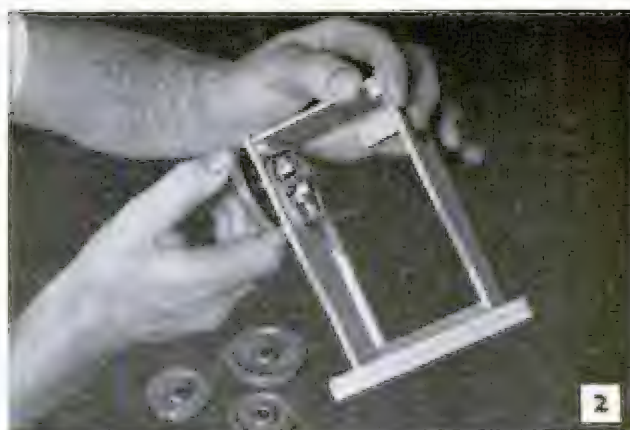


THE "RADIO" BIRDHOUSE

By R. J. DeCristoforo

USUALLY found in fancy powder boxes, jewel cases, etc., Swiss musical movements are put to a new use in these two intriguing novelties. For, in addition to playing a tinkling tune, the spring action of the movements is utilized to drive a small band wagon and to turn the animated dial of a toy radio. While the movements are available in various sizes, small units are recommended for both of these novelties.

The band wagon is designed so that the musical movement propels the wagon by driving the left-rear wheel as the spring unwinds. Consequently, this wheel is used to rewind the spring movement. Fig. 1 details the assembly of the wagon. Use cigar-box wood to make it as lightweight as possible so as not to tax the power of the tiny spring movement. The movement is mounted so the winding stem projects through an oversize hole in the side of the wagon and is fastened in place by drilling and tapping two holes in the casing for small machine screws. The stop or shutoff wire of the unit projects through the top of the wagon. By bending the wire toward the rear of the wagon, sufficient tension is had to hold the stop in a set position. Rosette-headed machine screws are used to attach the wheels. Note in the case of the drive wheel that the screw is cut off and merely cemented in place. The drive wheel is attached to the



Left rear wheel is the drive wheel on band wagon and serves as winding knob for music movement

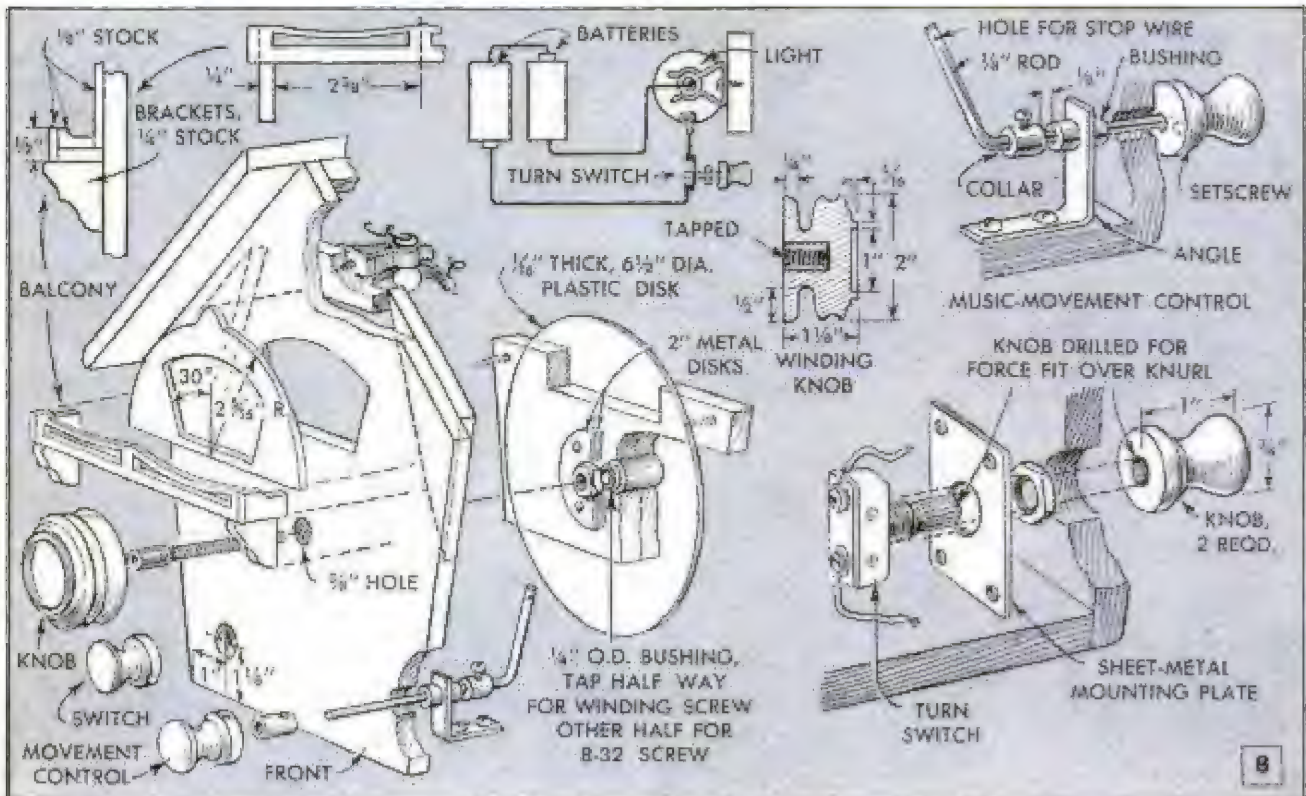
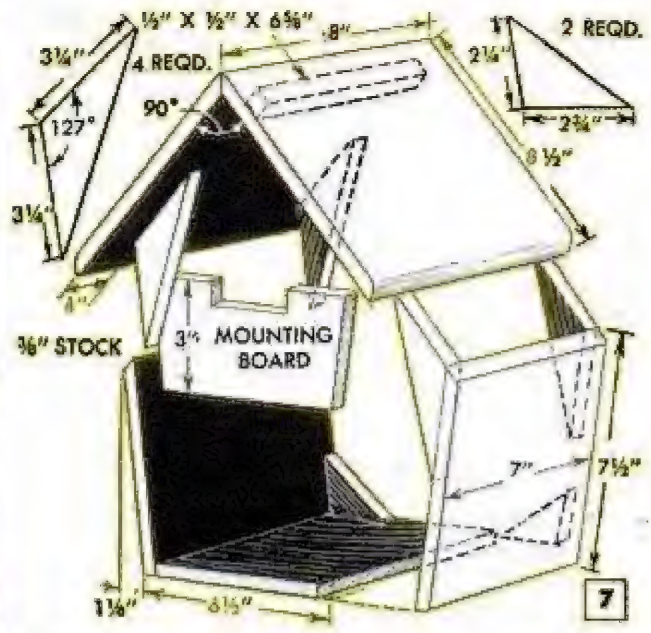


The shaft of the plastic radio dial is turned half-way through a threaded bushing on winding stem



Above, how stop wire of the movement is controlled by a trip lever. Below, the flashlight batteries supply current to light the dial lamp mounted above window





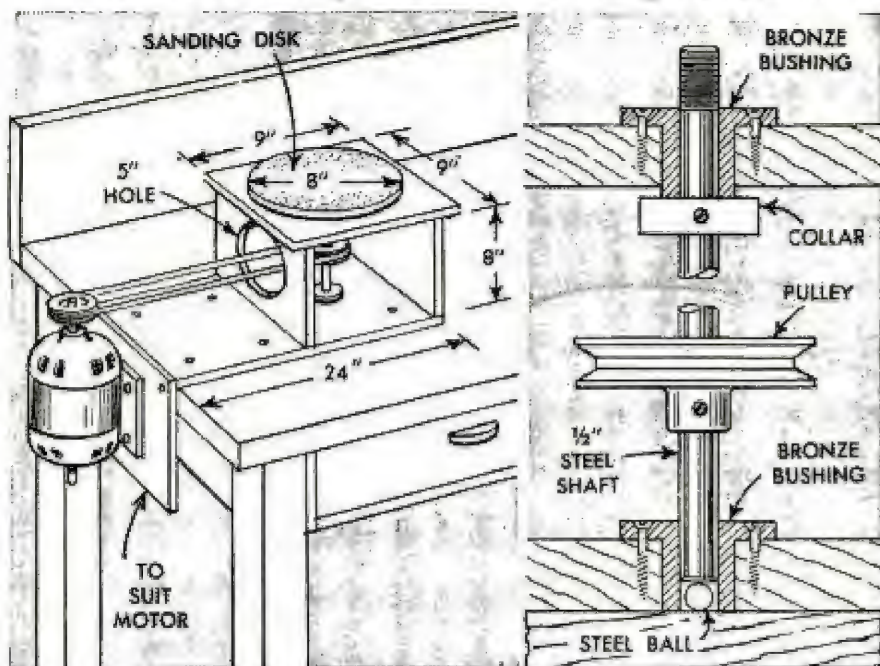
movement by forcing it over a short bushing which, in turn, is forced over the winding stem, Fig. 2.

The toy "radio" cabinet, simulating a birdhouse, is made according to Fig. 7, leaving off the front and back. The mounting board, to which the musical unit is attached, consists of two pieces of $\frac{1}{4}$ -in. plywood and in final assembly is screwed to the front corner braces. Fig. 8 details the dial mechanism. Holes through the front of the cabinet and the mounting board must align accurately. Fasten the musical movement to the mounting board so that the winding stem is centered in the hole and the stop wire points downward, as in Fig. 4, to contact a trip wire. Note that a bushing,

threaded internally, rotates within a bushing which is pressed in the hole in the mounting board. The inner bushing is threaded halfway for the winding stem and halfway for the dial screw. Now, using a temporary cardboard disk, Fig. 3, test the assembly. If the cardboard disk rotates freely, it is replaced with a permanent plastic one and the face of the cabinet is glued and nailed in place. Colored plastic is used for the permanent disk with small animal decals affixed on a radius that permits them to be viewed through the balcony window when illuminated from behind. A small switch connected to flashlight batteries is used to control a flashlight bulb, Fig. 5. Finally, the back, Fig. 6, is screwed in place.

Permanently fastened to the top of a workbench, this inexpensive disk sander is excellent for shaping small pieces of wood. The base, disk table and motor-mounting bracket are made from $\frac{3}{4}$ -in. scrap lumber, and the unit is set up so that the motor can be hung vertically over one end of the bench. A $\frac{1}{2}$ -in. steel shaft for the sanding disk revolves in bronze bushings, a steel ball at the base of the shaft providing a lower bearing. This ball can rest directly on the surface of the workbench, or the lower bushing can be set in a wooden block so the ball will ride on the sander base. A collar fastened to the shaft just under the upper bushing keeps the shaft from moving upward. Either a wooden or standard metal sand-

Horizontal Disk Sander Mounted on Workbench Provides Handy Tool for Forming Small Work



ing disk can be used. If a wooden disk is used, a flange is screwed to the center.

Marvin Hartley, Chicago.

House Numbers Are Readily Visible When Jigsawed in Novel Wooden Gate

In many cases where the design of a building makes it difficult to display house numbers so they can be easily seen from

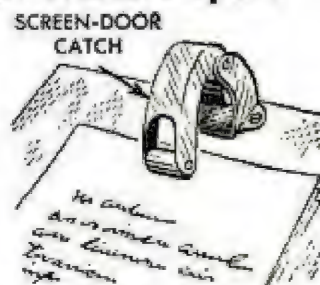
the sidewalk, the numbers can be incorporated in an attractive porch or garden gate where they are clearly visible. The construction of the gate shown is extremely simple, as it consists merely of three upright boards supported by two crosspieces. As the house pictured is a duplex, the numbers were jigsawed in the side boards and an interesting design cut in the center one. For a single dwelling unit, the address can be cut in the center panel and the side boards either left plain or decorated to suit. The gate should be painted to contrast with the background in order to increase the prominence of the house numbers.

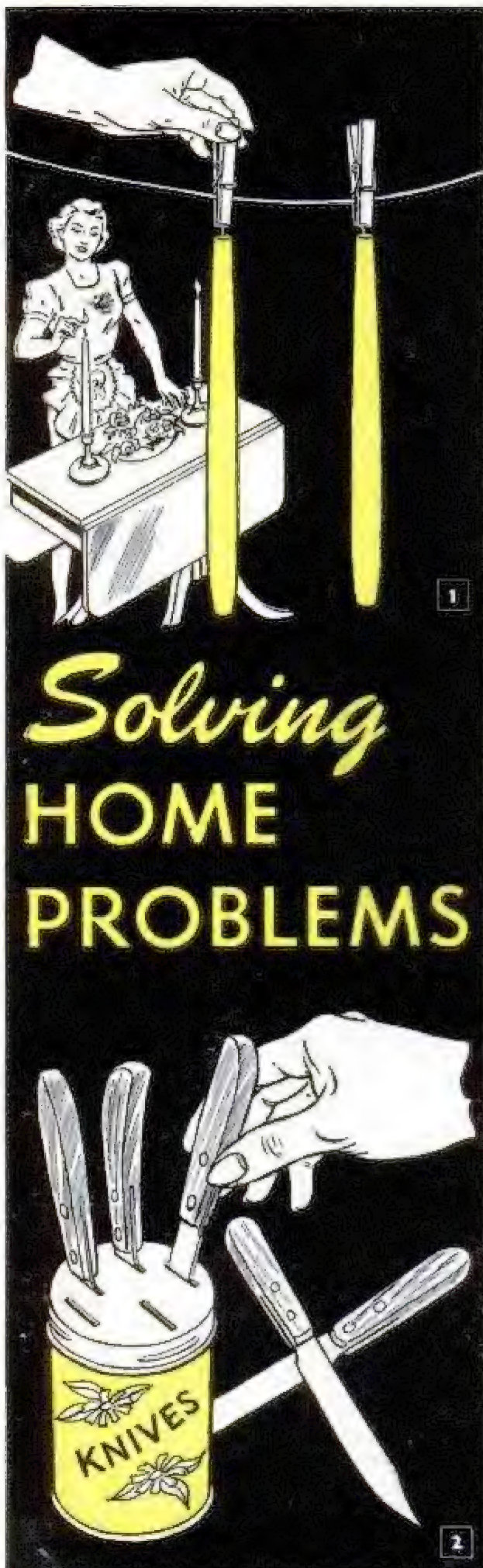
Eda Johnstone, Los Angeles, Calif.



Screen-Door Catch Holds Papers

Fastening a screen-door catch to a plywood base provides an excellent paper holder for use at the desk, on the job or when carrying a quantity of loose papers in the car. Cut a piece of plywood to a convenient size and then screw the catch to the top of the panel. This arrangement will keep a considerable number of papers neatly together for easy selection.





1 STORING LONG TAPERS so they remain straight in hot weather is a problem. Putting them away in a box doesn't always do the trick as, being tapered, they are still likely to bend. The best way to store them perfectly straight is to hang them by the wicks with spring clothespins that are threaded on a string

2 PARING KNIVES STAY SHARP longer when kept in a holder, especially if it is filled with sand. The sand tends to sharpen the cutting edges and keeps the blades separated. Such a holder can be made by slitting the top of a baking-powder can for inserting the knives and then decorating it with decalcomanias

3 STEPS CAN BE SAVED in determining whether a furnace-room light has been left burning by sticking a small tab of adhesive tape to the switch. Applied over the "on" position stamped on the toggle, the tape serves as a telltale which can be seen from a distance when the light itself is not visible

4 LINING IN SPECTACLE CASE, if badly worn, may result in scratching the lenses of your glasses unless renewed. To avoid this until new lining can be inserted, use a pipestem cleaner. The cleaner, which is shaped as shown, provides a temporary lining to cushion the lenses and prevent possibility of scratches

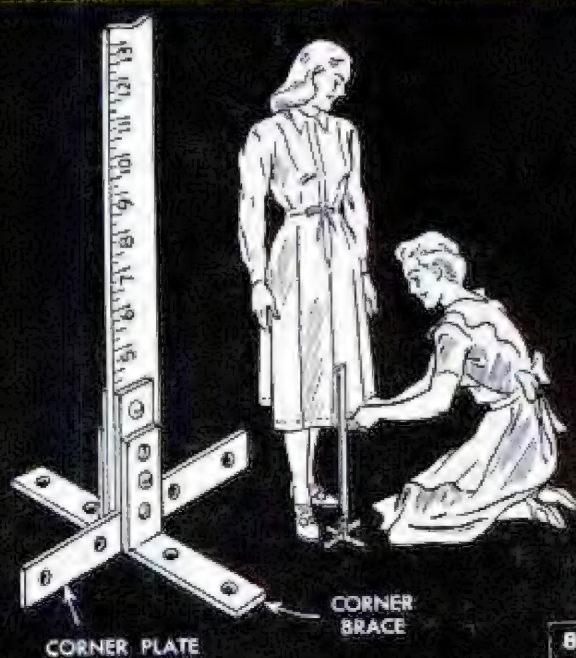
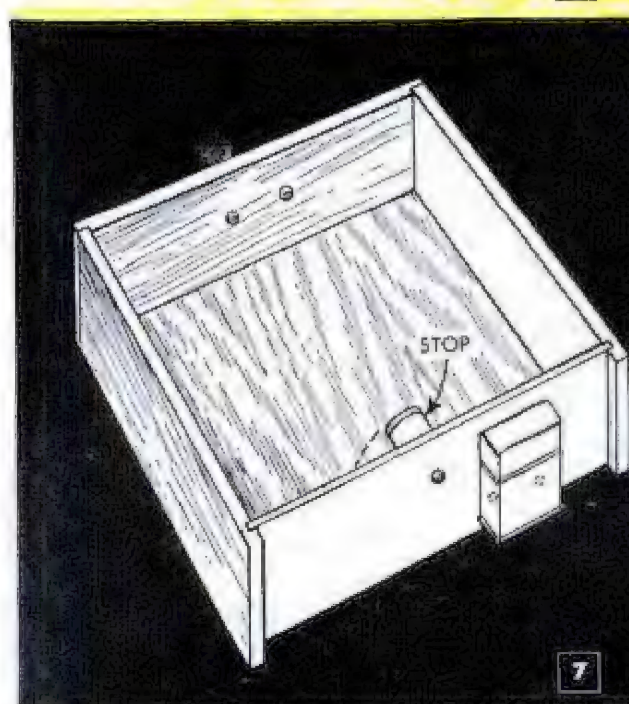
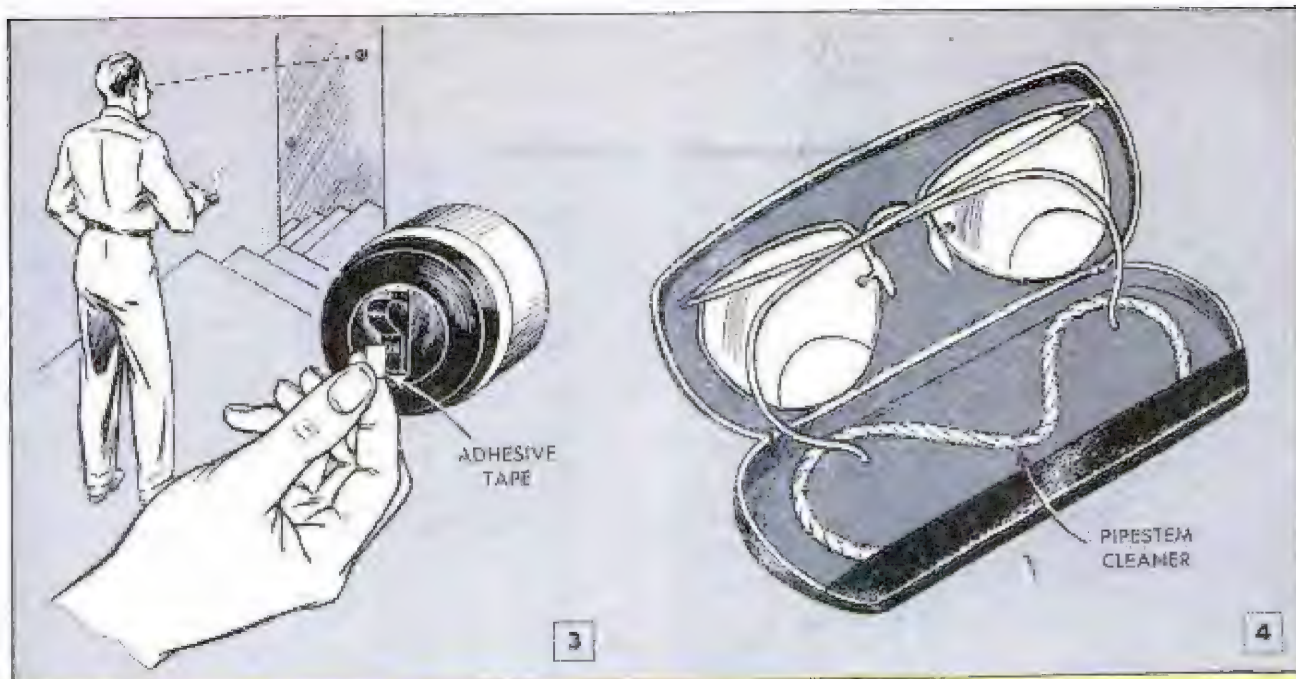


5 MATCHING BUTTONS cut from an old garment and saved for reuse can be found quickly in sewing box if held together with cellulose tape. The buttons are sandwiched between two strips of transparent tape so they can be seen at a glance. The buttons are merely snipped off the strip as needed

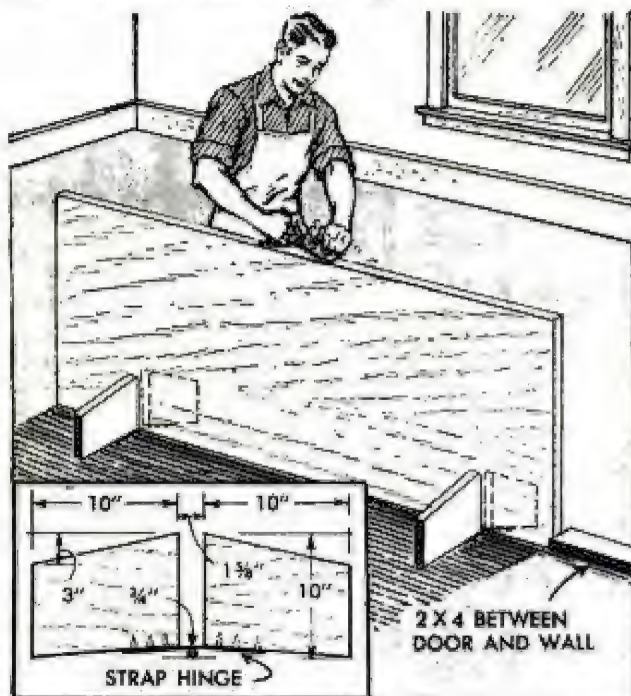
6 A MIXER STUNT worth remembering is one that prevents batter from being thrown from the bowl. Take a paper pie plate and make a hole in the center for the beaters. Then cut a slot in from the edge to meet the hole. Placed over bowl, the plate serves as a cover to catch any batter tossed by the beaters

7 A GOOD HIDING PLACE for small valuables is at the rear of a dresser or vanity drawer. Usually there is enough space behind drawer to accommodate a flat can, such as a tobacco can, which is fastened with screws. A turn-button stop attached to face of drawer back prevents unauthorized drawer removal

8 INEXPENSIVE SKIRT MARKER can be improvised from a yardstick, two metal corner plates, two corner braces and a small stove bolt. The metal items are assembled as shown to form a base for the yardstick. Original holes in the corner plates are used, but new aligning ones must be made in braces



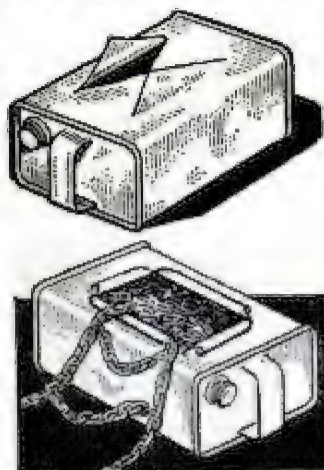
Self-Gripping Support Blocks Hold Door for Planing



Consisting of four wooden blocks and two strap hinges, this pair of jacks makes it easy to support a door on edge for planing. The weight of the door resting on the hinges causes the jacks to close so they clamp the sides of the door tightly, providing a solid base. A 2 x 4 is placed between the end of the door and a wall to permit planing the full length of the door.

C. E. Lehman, Fresno, Calif.

Tire Chains Carried in Oilcan



Tire chains can be carried neatly in the trunk of your car without rattling and, at the same time, be kept from rusting if you store them in a motor-oil can. Cut an "X" design in one side of the can, roll back the four triangles of sheet metal and press flat with pliers. Sprinkle a few

drops of motor oil over the stored chains to prevent rusting. The container also is an excellent place to keep a tow cable.

Arthur Gamlin, Kansas City, Mo.

Keep Fire Extinguisher Handy

A fire extinguisher kept in a handy spot in the house may prove to be your most valuable possession. Hang the extinguisher

at shoulder height from a closet or pantry wall where you can reach it quickly when it is needed.—Michael Ligocki, Gary, Ind.

Tape Aids Starting Screws

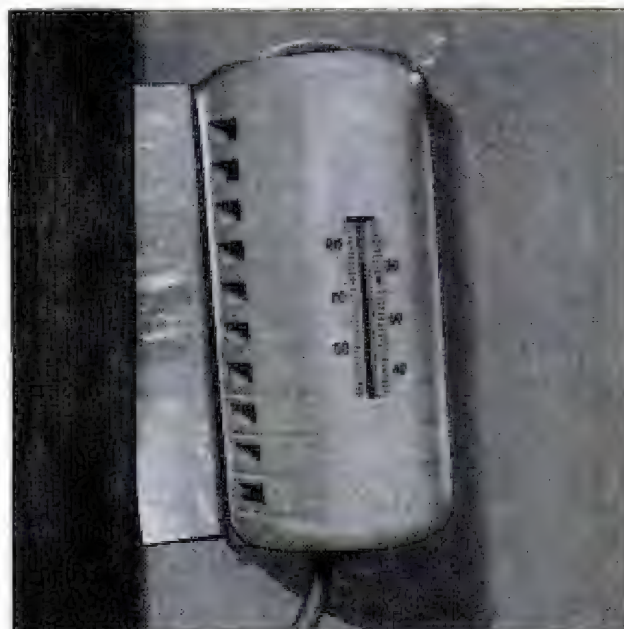
In places where screws cannot be held in starting position with the fingers, they can be started easily if they are taped to the tip of the screwdriver. With the tip in the screw slot, a small piece of cellulose tape is wrapped around both the head of the screw and the end of the screwdriver. The greater width of the tape should be stuck to the screwdriver blade so that when the latter is pulled from the screw the tape will be removed with it.



Victor H. Lamoy, Upper Jay, N. Y.

Thermostat Mounted Temporarily To Determine Best Location

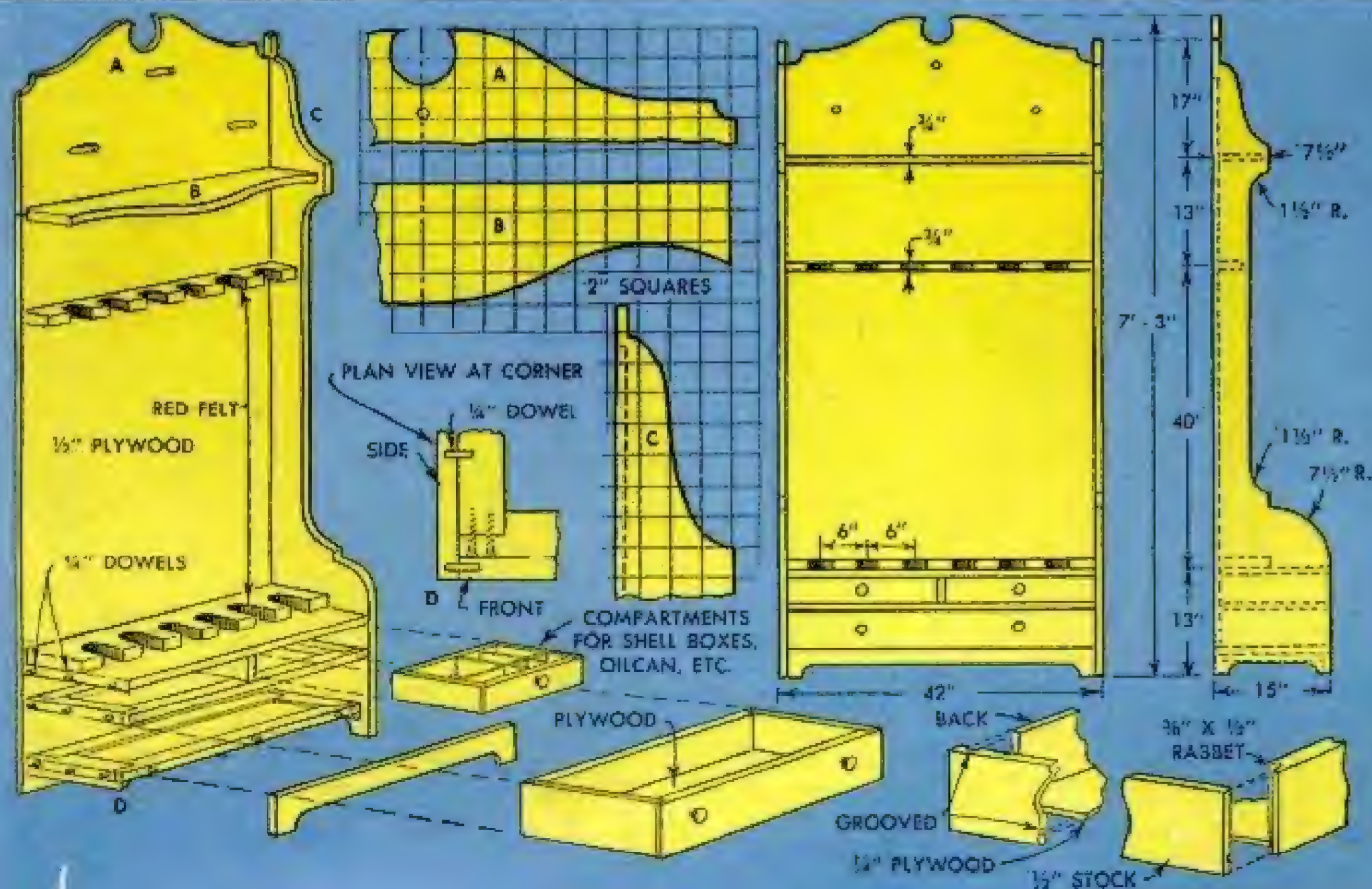
The most efficient location for a furnace thermostat can best be determined by mounting it for a few days in different parts of the house. To do this without damaging the walls, fasten the thermostat to a block of wood and tack a piece of sheet metal to the back of the block. Then wedge the sheet metal between the interior trim of the room and the wall, leaving the thermostat control wires free. In this way, the thermostat can be moved about until the best location is determined and then mounted permanently on the wall.



GUN CABINET

THIS OPEN cabinet provides rack storage for six of your favorite shotguns and rifles in the minimum of floor space. There also are pegs for hanging handguns and drawer storage for ammunition and accessories. Maple in ruddy color or knotty pine finished natural are the best choices in woods. Use two pieces of ½-in. plywood for the back and lay out and cut the top piece in the simple broken-pediment design detailed at A in the drawing below. The sides and top shelf are scroll-cut from solid stock as in details B and C. Assemble the drawer rail and runner frames. Then dowel top and bottom shelves and drawer frames to the sides, using a waterproof glue in the joints. The scrolled apron is doweled to the lower drawer rail as shown in detail D. The gunstock rack is made from measurements taken directly from the individual guns. Line the notches with ¼-in. red felt. Make drawers with rabbeted and grooved joints as in the lower detail below. Sand all parts thoroughly.

Hi Sibley, Nuevo, Calif.



Rep - 23 Boats you can build



Your Iceboat "Scoot"

By Doug Rolfe

PART I

FEATUREING rudderless steering and a flat, shell-type hull, here's a unique 15-ft. racing iceboat, the original of which dates back historically to early days when it was used in lifesaving work on the Great South Bay. Born of the necessity of being able to cross the bay even when it was only partly frozen, "Scoot," in addition to its high speed and extraordinary maneuverability, is noted for its ability to take to open water, if necessary, in hurdling large patches of broken ice. Speeds greater than 80 m.p.h., achieved with as many as four passengers, put Scoot in the racing class and, as a result of its four-point runner suspension, its maneuverability is extremely flexible, permitting sharp turns without danger of capsizing or skidding. Steered by

manipulating a large-size jib sail, Scoot can be held on an arrow-straight course or turned almost literally on a dime.

As designed and built by Bill Harless, noted racing champion, this version of the scooter-type iceboat is the result of prolonged experimentation and development. The hook sail rig used is, in effect, a high-performance airfoil and, because of it, Scoot glides along effortlessly in the mildest breeze and literally scoots past competition with a strong wind. The boat is moored by merely tipping it on edge with the sails flat on the ice. Except where modified to simplify construction, the plans presented here were taken directly from the actual boat. Original hardware, which was especially designed and cast in brass, has been replaced with less expensive fittings that can readily be improvised from common

Nothing in fast-action outdoor sports quite equals the smooth, swift flight of "Scoot"—a shell-type racing iceboat. Designed to hurdle patches of broken ice, Scoot features extraordinary maneuverability, rudderless steering, a hook sail rig, a nonslip deck and a 15-ft. planked hull with four-point runner suspension





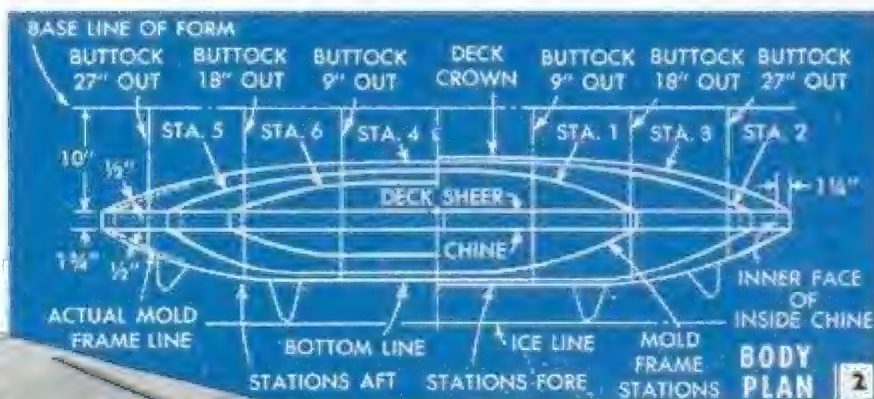
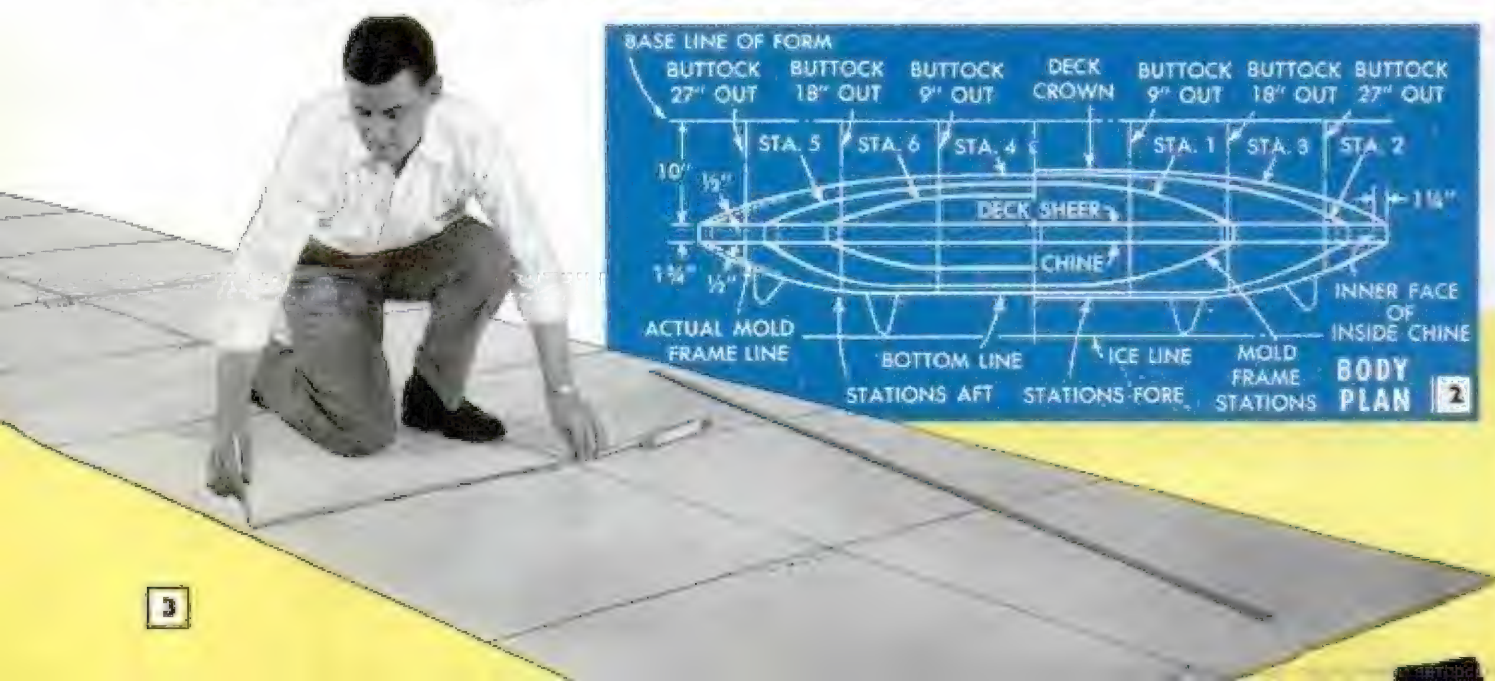
parts easily obtainable.

Part I details construction of the hull, while the second and final installment, appearing next month, will discuss the making of the masts and the unusual hook sail rig.

The first step in building the hull is to draw the mold frames and the plan and profile views full size on heavy building paper; Fig. 3. The plan view is drawn by following the half-width dimensions given in Fig. 4, while the profile and mold frames are drawn by referring to the table of offsets in Fig. 1 and the body plan, Fig. 2. The body plan is an end view of the plan and profile. Note, in Fig. 4, that half-width dimensions are given to the inner face of the inside chine which is the line from which the mold frames are laid off. Offsets are given to the outside of the planking, so remember to deduct the thickness of the planking. In laying out the lines full size, use a long batten to fair out the curves. Any good boat-building book will show you how this is done. Considerable tolerance is permissible in establishing the lines as long as you do not exceed

TABLE OF OFFSETS—Measurements From Base Line to Bottom of Hull*									
1	STATIONS	Bow	1	2	3	4	5	6	Stern
	Deck crown line	0-10-0	0-6-0	0-5-2	0-5-0	0-5-2	0-6-0	0-7-2	0-10-0
	" buttock 9" out	—	0-6-6	0-5-3	0-5-0	0-5-3	0-6-2	0-7-3	—
	" buttock 18" out	—	0-9-6	0-6-2	0-5-5	0-6-1	0-7-4	0-9-3	—
	" buttock 27" out	—	—	0-9-0	0-7-4	0-10-1	—	—	—
	Deck sheer line	0-10-0	STRAIGHT						0-10-0
	Chine line	0-11-6	STRAIGHT						0-11-6
	Bottom buttock 27" out	—	—	1-0-7	1-2-4	1-1-7	—	—	—
	" buttock 18" out	—	0-11-7	1-4-1	1-4-7	1-4-3	1-3-0	1-0-1	—
	" buttock 9" out	—	1-3-2	1-4-5	1-5-0	1-4-5	1-3-6	1-2-2	—
	" at center line of hull	0-11-6	1-3-6	1-4-5	1-5-0	1-4-5	1-3-6	1-2-2	0-11-6

* As the hull is built in an inverted position, measurements or heights are given from the base line, Fig. 2, to the bottom of the hull. Dimensions are in feet, inches and eighth inches to the outside of the planking. All plus or minus dimensions are to be converted as required when laying out full-scale lines. Half-width dimensions for mold frames are given to the inner face of the inside chine. This apparently complicated method of establishing the mold-frame dimensions is necessitated by the characteristics of the hull, which is of the carvel type. All were taken from the original boat



EVOLUTION OF "SCOOT"

Unique in man's long search for ways to improve wind-driven ships, the scooter-type iceboat first came into being on the Great South Bay of the New Jersey coast. Born of necessity when a means was needed to cross the bay even when only partly frozen, the forerunner of Scoot was put to work in life-saving service. It at once proved superior to the flat-runner punts which had been piked across the ice and sculled through water at arduously slow speeds. After a few runs, a small sprit was added to the sail rig of Scoot. From sprit to gaff was but a step, followed by the Gunther and modified Marconi and, finally, by the double-luff sail and hook mast. This led to rigging a blade on an oar handle to serve as a rudder, and later the addition of a jib. By carefully balancing the rig, it was found that steering could be done entirely by manipulating the jib. Then came the change-over from flat to angle-type runners which helped hold a straight course when sailing on hard ice. To improve the jib, a boom was laced along the foot. Later, the lashing was moved aft of the jib boom to permit the jib to swivel. It was then that the scooter came of age in both speed and maneuverability, and soon baymen began racing their unusual craft, joining sportsmen in organized competition.

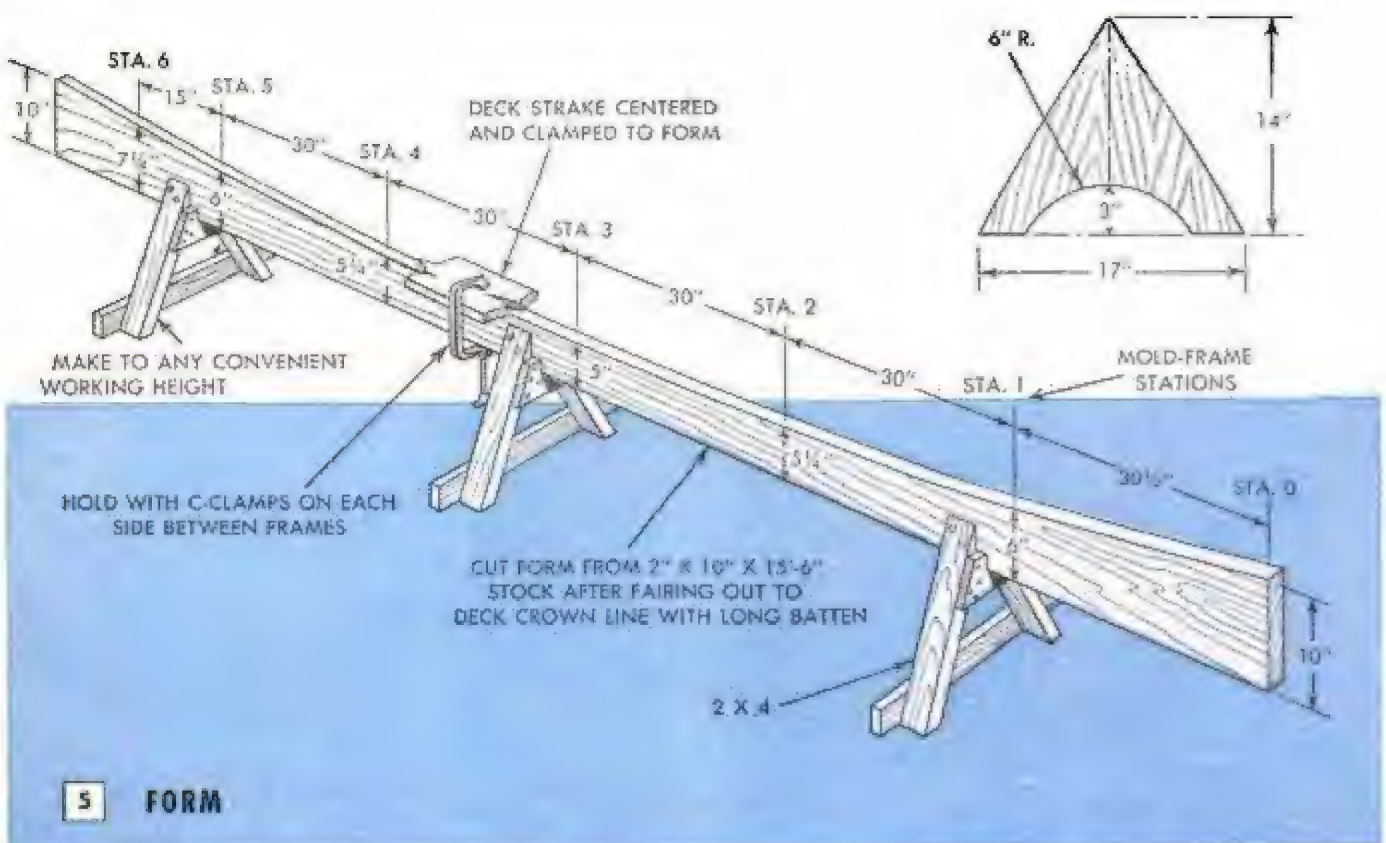
the maximum dimensions given in the plan.

The hull is built in an inverted position on a building form, Fig. 5. While the form can be supported in the manner shown, it

also can be mounted on regular sawhorses. The center deck strake is fastened temporarily to the form with C-clamps and screws and then the mold frames are set on the strake at the station points as in Fig. 7. Note here that the mold frames are leveled carefully and are held in position laterally with braces running to the floor. Next, inside chine stringers, which are $\frac{3}{4}$ in. thick, are nailed temporarily to the ends of the mold frames. The ends of the chines are pulled inward at the bow and stern with rope slings and are fastened permanently to the breasthook and stern block with brass screws. After this, a $\frac{1}{2}$ x 6-in. keel apron is tacked temporarily to the mold frames and fastened permanently to the breasthook and stern block, Fig. 7.

Permanent frames consisting of bottom timbers and deck beams are made next. While best construction calls for steaming and bending these pieces in jigs, they can be bandsawed to shape if steaming facilities are not available. The permanent frames are installed by placing them 9 in. apart on the strake and holding them in position with two temporary longitudinal battens. Then they are screwed to the deck strake, chines and keel apron. With this done, the inside chine pieces are beveled to conform with the frame lines and then notches are cut in the chines for chain plates, Fig. 8.

Now the bottom planking is laid. The photo, Fig. 6, shows the planking partially completed. As the hull does not have to be



absolutely watertight, calking is not required. However, the planks should be shiplapped, or tongued and grooved at the joints. The planking is begun at the keel apron and, when completed, it is trimmed off flush with the outer edge of the inside chines.

The hull can now be removed from the form. The mold frames and their bracing are removed and the hull is supported right side up on sawhorses. The main and bilge-runner clamping pieces come next. These are fastened to each frame and holes are drilled in them for the runner bolts. The holes are located either aft or forward of each bottom timber as indicated in Fig. 10. Do not pass the bolts through the bottom timbers.

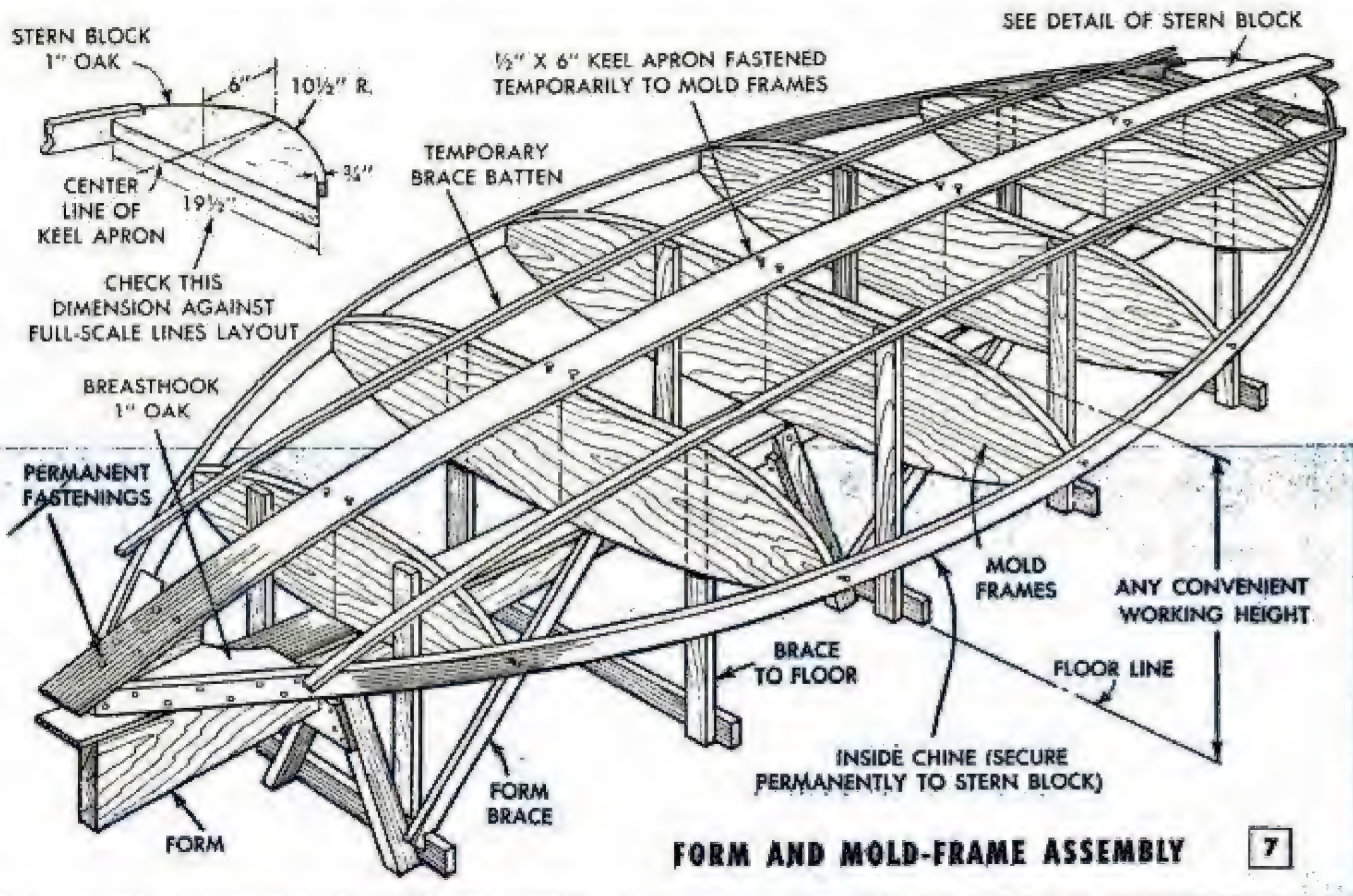
The mast step block is fastened to the bottom timbers as shown in Figs. 9 and 11. The mast step itself is a length of $\frac{3}{4}$ -in. galvanized pipe. This is threaded into a standard pipe flange and the flange is screwed securely to the mast step block. The pipe should be just long enough to pass

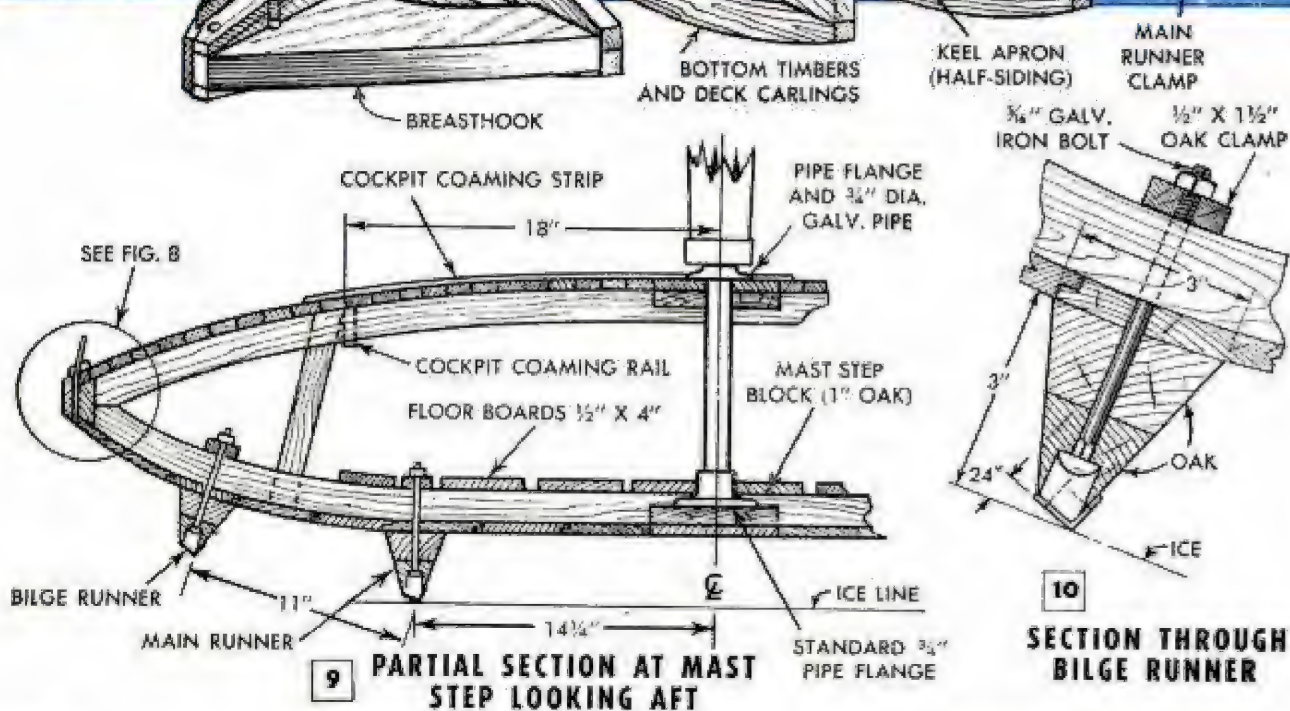
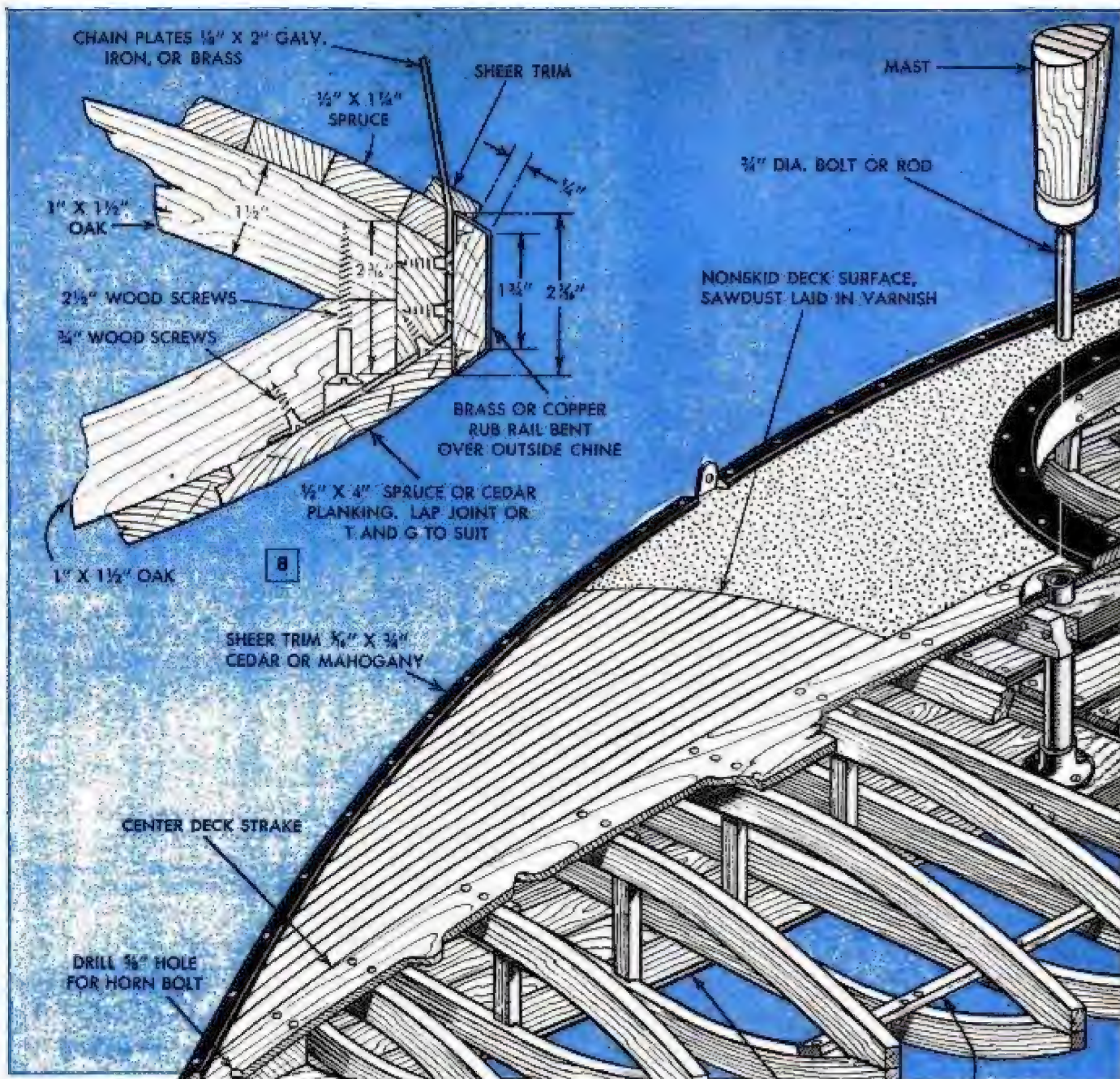
through the mast partner, which provides an upper step, and the deck strake, coming flush with a flange screwed to the strake.

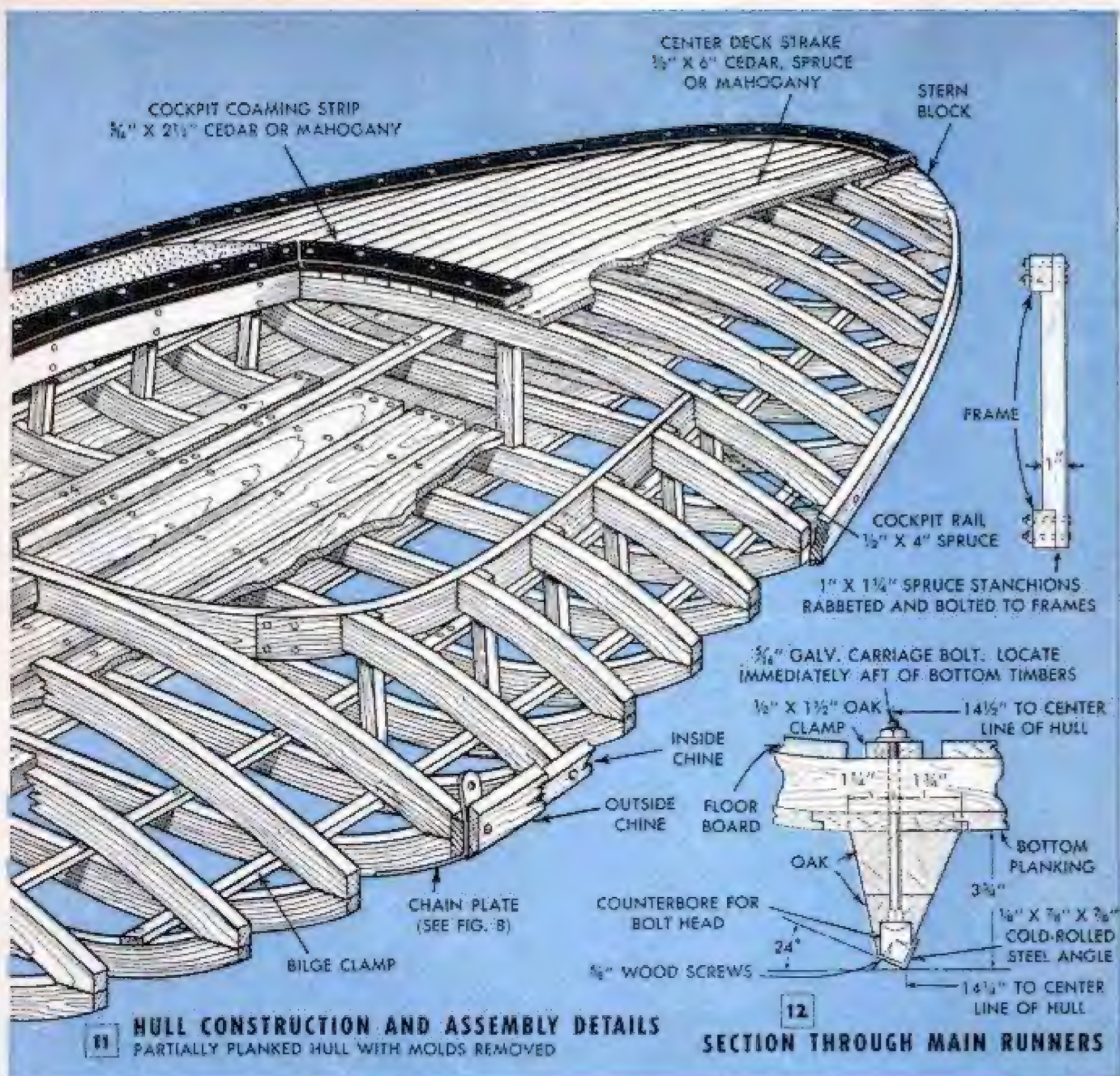
Cockpit framing and the stanchions which support it are installed next. Note that stanchions also are installed at the center of the frames, fore and aft of the cockpit. The ends of the stanchions are cut to lap the face of the frames as shown in



Original "Scoot" under construction. Note that the bottom planking is being applied after deck planking, a reverse procedure used by builder. It was found, however, more practical to plank the hull as described







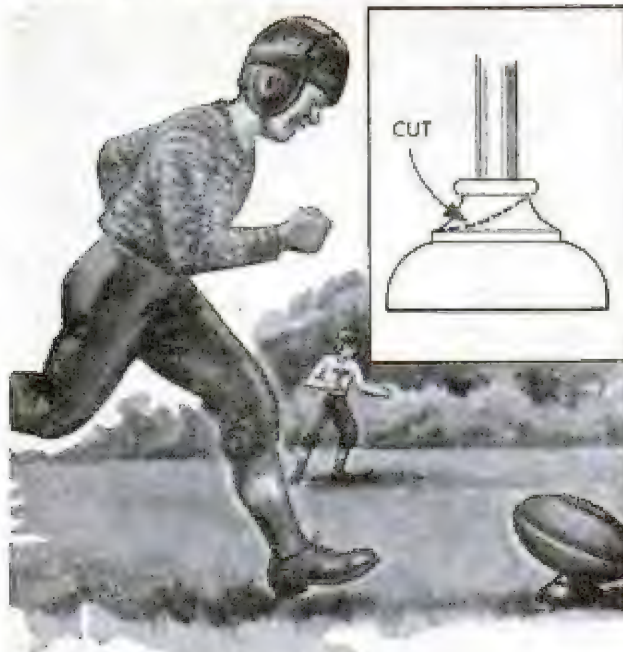
the detail above Fig. 12. With all interior framing completed up to this point, the decking is laid. Narrow planks, 1 1/4 in. wide, make this a simple job. The same procedure is followed here as was used in planking the bottom, working outward from the deck strake and trimming off the planks flush with the inner chines. For a neat job, countersink all screws and fill with wood putty. As will be noted in Figs. 8 and 11, the face of the inside chines and the edges of the deck and bottom planking are covered with an outside chine piece, 1/2 in. thick, which also is beveled off flush with the deck and bottom planking. Before fastening the outside chine, the rub rail should be flanged over and tacked to the inside face of the chine. The rub rail, of brass or copper, is applied to the chine from the mast station to the aft end of the cockpit and prevents scuffing when the hull is heeled over. After the outside chine

has been fitted, the sheer trim is attached. This is set inward about 1/4 in. and covers the joint between the decking and the outside chine. Completion of the hull involves fitting a coaming strip around the cockpit and installing the flooring, Fig. 9. Note that the screws in the floor boards are driven in countersunk holes and puttied over.

The bilge and main runners may be shaped from solid stock or built up of two or more laminations. All runners have a slight curve or rocker, 5/8 in. in 11 feet. They are bolted to the hull according to the dimensions given in the plan and profile views, Fig. 4. Note in Figs. 10 and 12 that the runner shoes, which are angle iron, toe inward. This is important and has a definite bearing on the performance of the iceboat. The shoes are fastened to the runners with screws, spaced 6 in. apart and staggered on each side.

(To be continued)

Football Tee Made From Plunger



The suction cup of a drain plunger provides an ideal kickoff tee for youngsters' football games. After removing the handle from the plunger, cut the neck of the suction cup so that the football will be balanced at the proper angle.

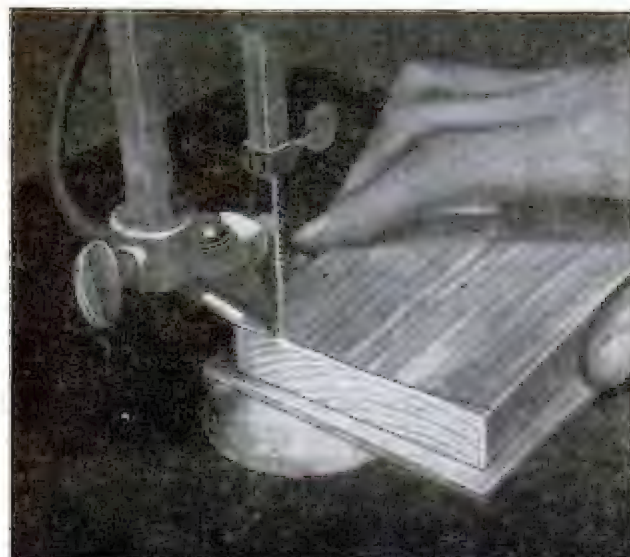
Arthur Trauffer, Council Bluffs, Iowa.

Syrup Pitcher Dispenses Salt

Salt and flour are conveniently dispensed at the kitchen range if they are kept in no-drip syrup pitchers. The covered pitchers keep the items dry and clean and permit pouring with one hand.

Thin Board Held Under Work Insures Smooth End Cutting

When using a jigsaw to cut a thin strip from the end of a board, small pieces of stock ordinarily break off, resulting in a ragged edge. A smooth, even cut can be



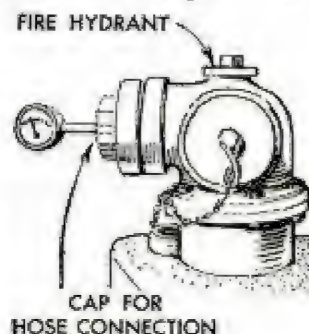
made if a second piece of wood is held under the work so it extends beyond the saw cut. This piece will guide the saw blade, allowing the operator to follow the cutting line accurately.

Richard Hanscom, Elmhurst, Ill.

Water Pressure Read at Hydrant By Gauge Mounted on Cap

One city water department solved the problem of obtaining quick pressure readings by fitting a water-pressure gauge permanently to an extra fire-hydrant cap. The cap is simply screwed to a hydrant outlet and the hydrant turned on to give the pressure reading. In this way, the water pressure can be checked at any strategic point in the system without disrupting service.

Lewis F. Garber, Blacksburg, Va.



Copper Float Provides Candy Dish

Something novel in the way of covered candy dishes can be had by assembling a flush-tank float, a lamp-base cap and a knob-type drawer pull. The seam around the center of the copper float is first broken with a file to separate the float into two parts. This leaves a small lip around the rim of each half. A 1/4-in. copper strip is soldered around the inside of the rim of the bottom half, which will serve as the bowl. The strip should project slightly above the rim to aid in locating the upper half of the float, or cover. The lamp-base cap is fastened to the threaded stud at the bottom of the bowl with a screw and washer. Then, a hole is drilled through the top of the cover to permit attaching the drawer pull. If all parts are of copper, simply polish the candy dish, but if different metals are used, it is best to have the unit plated.—S. S. Palestrant, Bronx, N. Y.

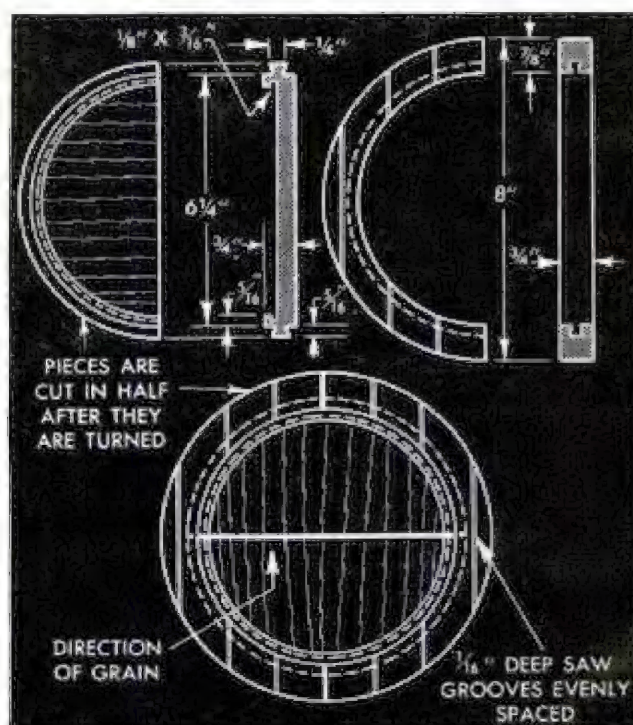


¶ A layer of heavy brown wrapping paper placed on the table under a new oilcloth will make the cloth wear longer.

WALNUT Picture Frame

By Benjamin Nielsen

HOME DECORATORS appreciate the adaptability of a round picture frame, especially when displaying informal portraits either individually or in groupings. This one consists of a turned ring of selected walnut and a disk, or picture backing, held together by a sliding dovetail joint. The outside ring which forms the frame is turned first. Before parting the ring from the waste, the dovetail groove is formed with a tool made from a discarded file. The ring also is sanded and shellac-finished before parting. The backing disk is turned to the shape shown in the left-hand sectional detail below. A matching dovetail is formed on the edge and the groove for the glass is undercut in the corner of the recess as shown. The exposed edge of the disk is sanded in the lathe and shellac-finished. Then the ring and disk are sawed in half and equally spaced shallow saw cuts are made across the outer face of the ring as indicated. Cut a circular piece of glass to the same radius as the undercut groove in the backing disk, and trim the picture to the same diameter as the glass. Then place the parts in the position shown in the lower right-hand photo. Slide them together and, gripping the backing disk and the glass between the fingers and thumb of one hand, give the outer frame a quarter turn. This movement locks the parts together so the joints are barely noticeable.



Bobby Pin Secures Lapel Button



If you want to be sure that a loose-fitting service or lodge lapel button does not drop off, lock it in the buttonhole with an ordinary bobby pin. Slip the pin between the underside of the lapel and the back of the button as shown in the detail. In addition to holding it in place, this also keeps the button from turning.

F. Wyman Johnson, Weston, Mass.

Safe Jack-o'-Lantern for Halloween



Inserting a flashlight in the mouth of a paper bag is an easy way to make a perfectly safe jack-o'-lantern that will delight the youngsters. Select a large paper bag, preferably white, and paint a comical face on one or both

sides. Then insert the flashlight, leaving the switch exposed, and tie it in place with string or ribbon.

Mrs. Cherie L. Howard, Memphis, Tenn.

Leave House Key in Mailbox

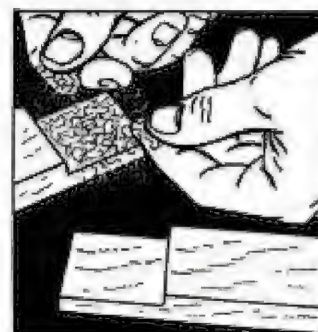
It is sometimes necessary to leave the front-door key where a member of the family will be likely to find it. An excellent way to do this is to place the key in an envelope addressed to the person for whom it is intended. Then, slip the envelope in the mailbox. As most people habitually check the mail when they come home, the

key ordinarily will be found, although its presence will not be noticed by a stranger who might come to the door while you are gone. It is best to wrap the key in a piece of heavy paper before placing it in the envelope.—Pat Fey, New York City.

Steel Wool Prevents Shifting When Clamping Glued Joints

A few shreds of steel wool placed between pieces of wood when gluing bite into the wood to prevent shifting while pressure is applied and also result in a stronger joint. Just sprinkle the shreds over the glue-covered surface before clamping the parts together. Grains of sand or metal filings will serve the same purpose.

Benj. Nielsen, Aurora, Neb.



Nail Polish Cements Watch Crystal

When a watch crystal becomes loose, it can be recemented in place with a few drops of clear nail polish. Remove the crystal and brush the polish around the inside of the retaining ring of the watch. Then, snap the crystal in the ring and wipe off any excess polish before it has a chance to dry. Allow the polish to dry for an hour or so before wearing the watch.

Harry C. Aichner, Jr., Erie, Pa.

Labels Printed on Glass Jars With China-Marking Pencil

To label glass jars before storing on a shelf or when taking small quantities of foodstuff on a trip, print the label directly on the glass with a china-marking pencil. Cover the lettering with a strip of cellulose tape to keep it from being rubbed off.

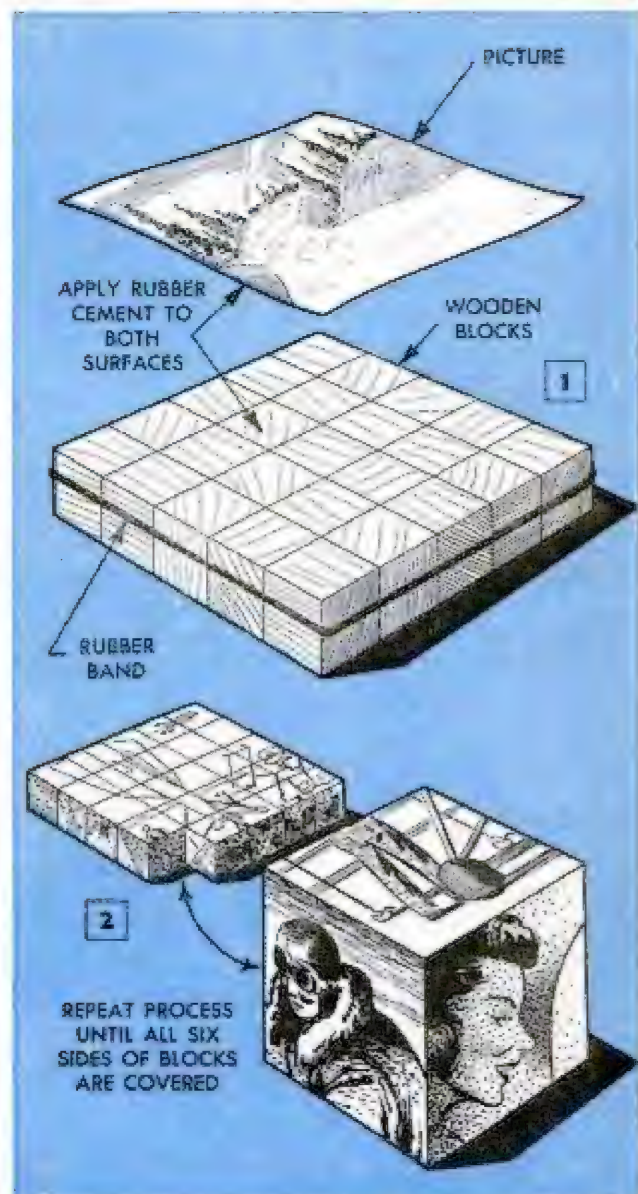
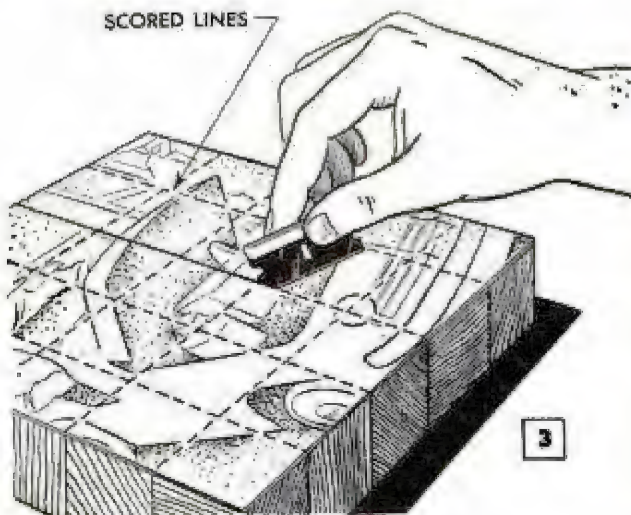


W T m - S . 1 . . .

Six-In-One PUZZLE

By Allan Carpenter

HERE ARE six exciting picture puzzles, all on one set of blocks. You can easily make the puzzle in one evening and everyone in the family will have hours of fun working out the six combinations. The puzzle pictured is made from 25 hardwood blocks, each 1 in. square. Fewer blocks, 16 for example, form a simpler puzzle for small youngsters. If you do not have a circular saw for cutting the blocks to exact size, suitable blocks in various sizes are available from toy stores. Use any type of picture, such as scenic views, photos, maps or flags. Maps, flags and similar pictures give the puzzle educational value, and each of the six pictures can be of a different type if desired. Assemble the blocks in a square and hold them with a rubber band as in Fig. 1. Coat the upper surface of the blocks with a quick-setting adhesive, such as rubber cement. Apply the cement to the back of the picture and place it over the blocks, pressing it firmly and smoothly in place. Then mark the picture both ways on the joint lines of the blocks and, following the lines, cut through the picture with a razor blade as in Fig. 3. When the blocks have been cut apart, press down the cut edges of the picture segments on each block. Assemble the blocks into another square with the blank faces up. Cement another picture to the surface of the blocks and cut apart as before. Continue this process until all six sides of each block are covered with parts of pictures. To solve the puzzle, the blocks must be placed in a square with the correct face up so that they form one complete picture. Pictures which are too large can be trimmed, or cropped, to retain the most interesting part.





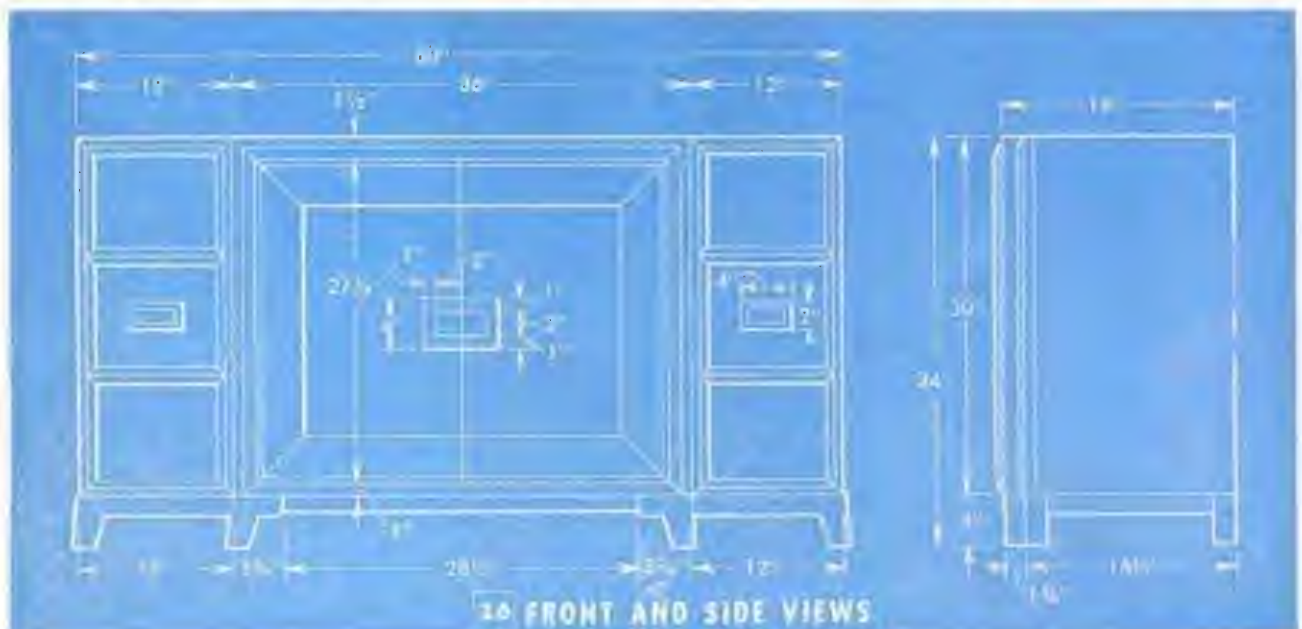
COMPLETING YOUR DINING-ROOM FURNITURE

By Wayne C. Leckey

Part II

WITH THE table and chairs completed as detailed in Part I, you should be ready to tackle the more pretentious pieces of the dining-room group—the credenza and the china cabinet. Construction of the

credenza is fairly simple as revealed in the cutaway drawing in Fig. 28. Over-all dimensions for this piece are given in Fig. 26, and a view of the interior, Fig. 27, shows how the doors are hinged, where friction catches are installed and how finger pockets in the rails are provided to facilitate



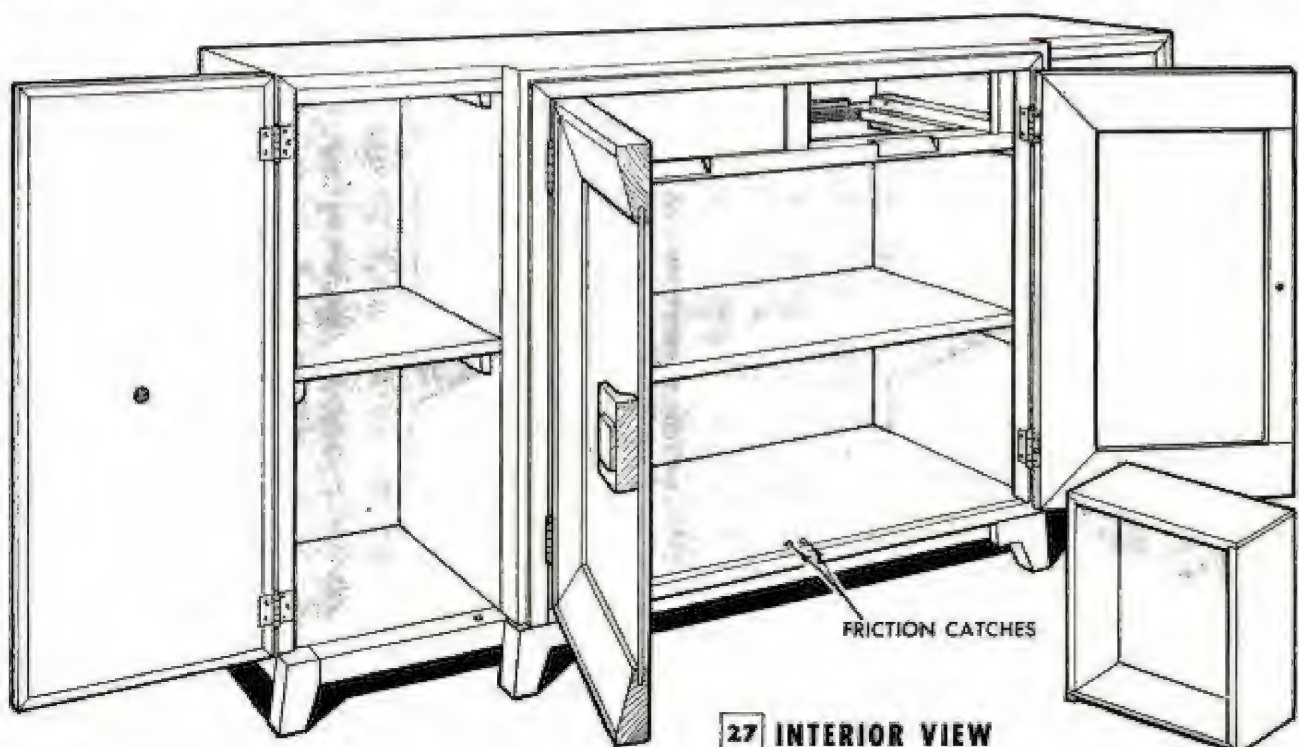
removal of the two silverware drawers.

Start the credenza by making the base framework. Each end is made up exactly the same, right and left hand, and then joined together with front and rear members. Section A-A in Fig. 28 gives the sizes of these members and shows how they are screwed together. Note that the $\frac{3}{4} \times 1\frac{1}{2}$ -in. strip placed on edge runs the full length of the base and is glued and doweled to the two rear legs. All legs are the same size and shape, six being required, three of which are made for the right side and three for the left. All are doweled to the rails. Note that the outside faces of the end rails are beveled to match the flare of the legs. Section D-D shows how intermediate rails are rabbeted along one edge to receive $\frac{1}{4}$ -in. plywood bottoms. Cleats are fitted on the three other rails to support the plywood. Center legs of the credenza are doweled to the face of the front rails 12 in. in from the corner. Then, the $1 \times 1\frac{1}{8}$ -in. strip is screwed to the projecting ends of the rails and small overlay blocks are used to conceal the screwheads. Section A-A shows how the back rail is built up of two additional pieces, both being the same length and set between the intermediate rails.

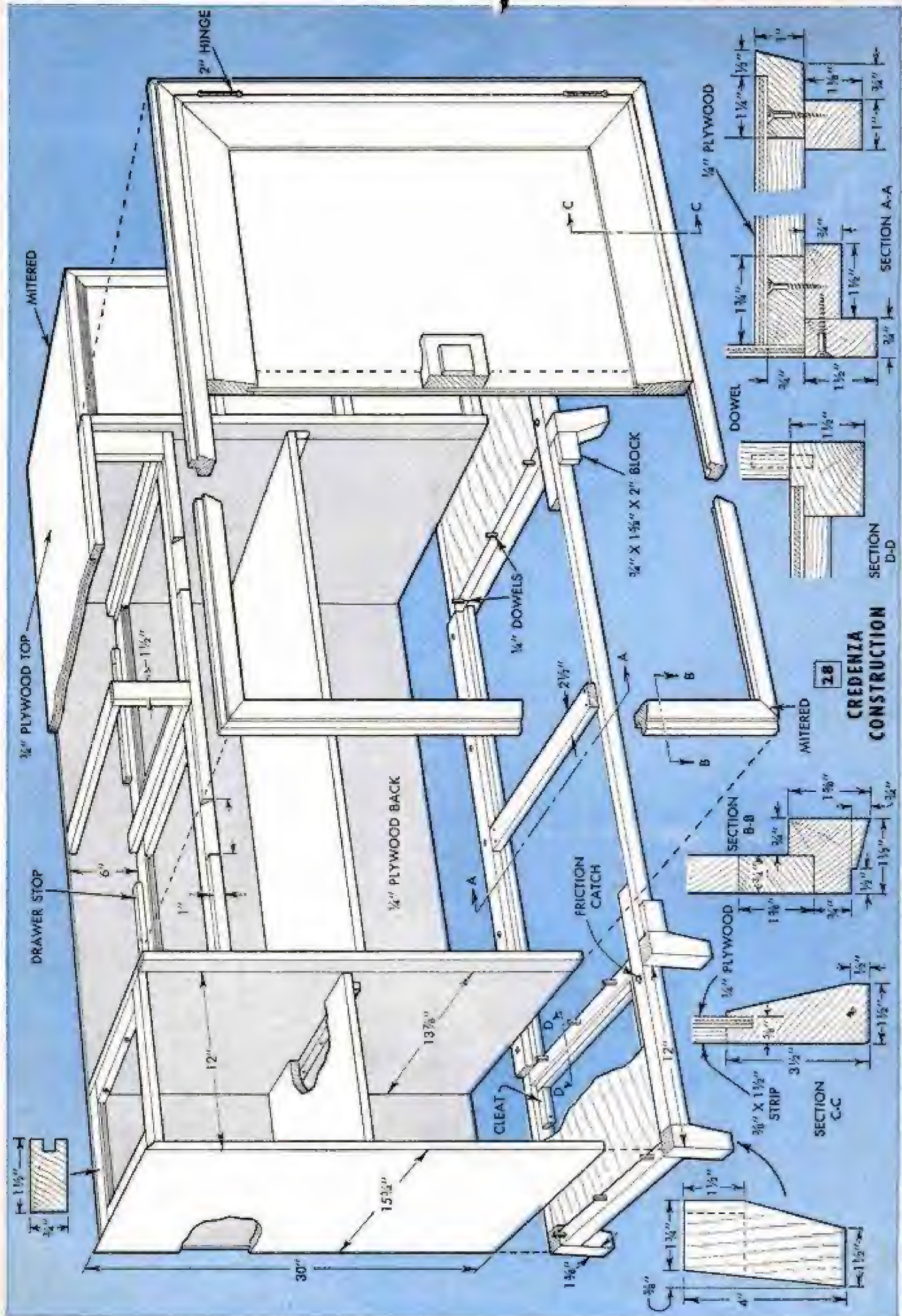
Next, the side members of the end compartments are installed. These are cut to size from $\frac{3}{4}$ -in. plywood. The upper ends of the outside panels are mitered 45 deg., while the lower ends are trimmed off squarely and bored for three $\frac{1}{4}$ -in. dowels, which are located in the base to bring the outer panels flush with the rail. The rear edges of the two outer panels are rabbeted for a $\frac{1}{4}$ -in. plywood back. The inner panels of each compartment are made $\frac{3}{4}$

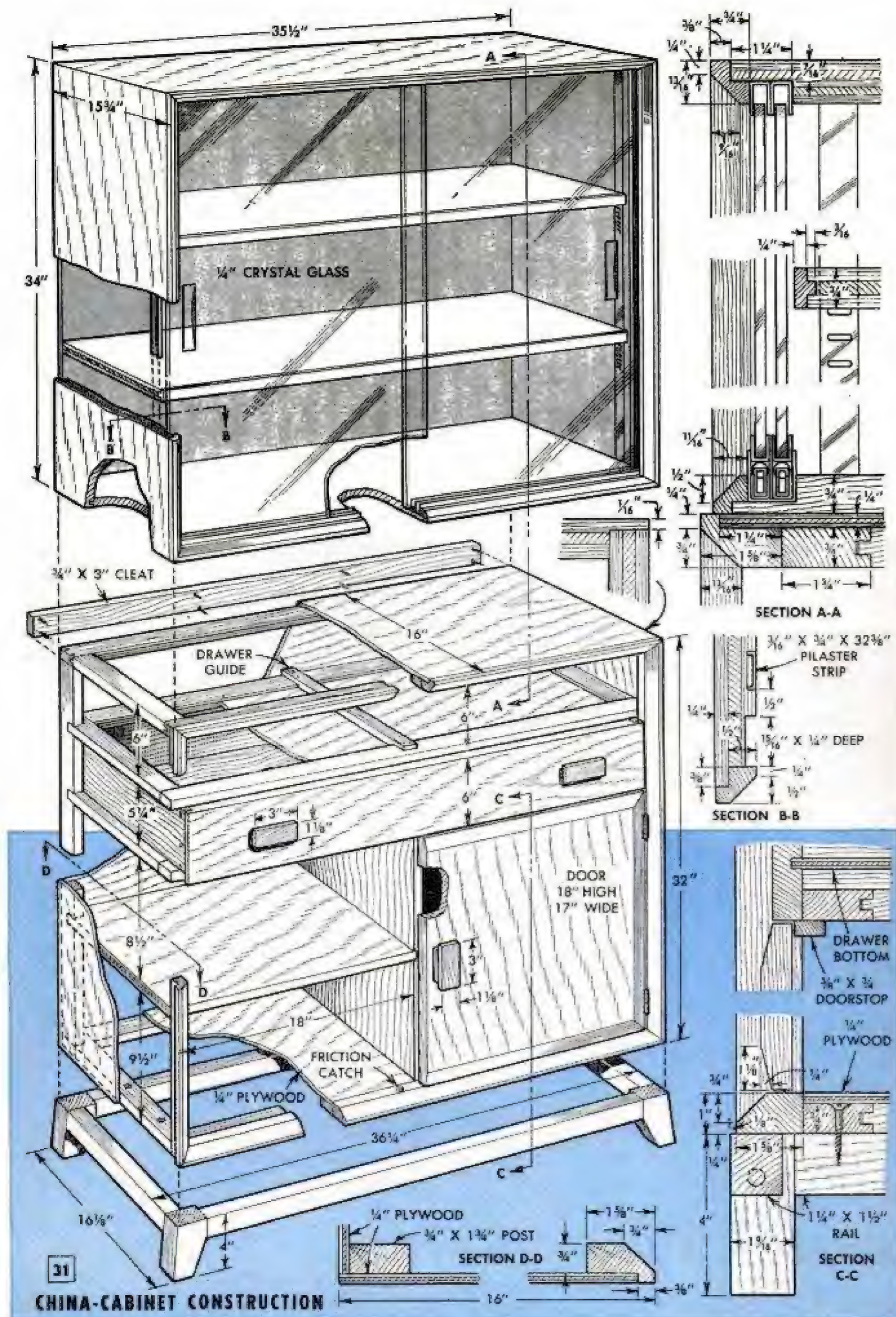


in. shorter than the outer ones and narrower to permit covering the plies of the wood with a $\frac{3}{4} \times 1\frac{1}{8}$ -in. strip of solid stock as detailed in section B-B. This strip is edge-glued and may be doweled for additional strength. The two panels of each unit are held together at the top with a frame of $\frac{3}{4} \times 1\frac{1}{2}$ -in. stock. Front and rear pieces of the frame are grooved on the inside edges for tenons on the sidepieces. The frame is screwed in place through the edge so it is even with the bottom of the miter and flush with the top of the inner



27 INTERIOR VIEW





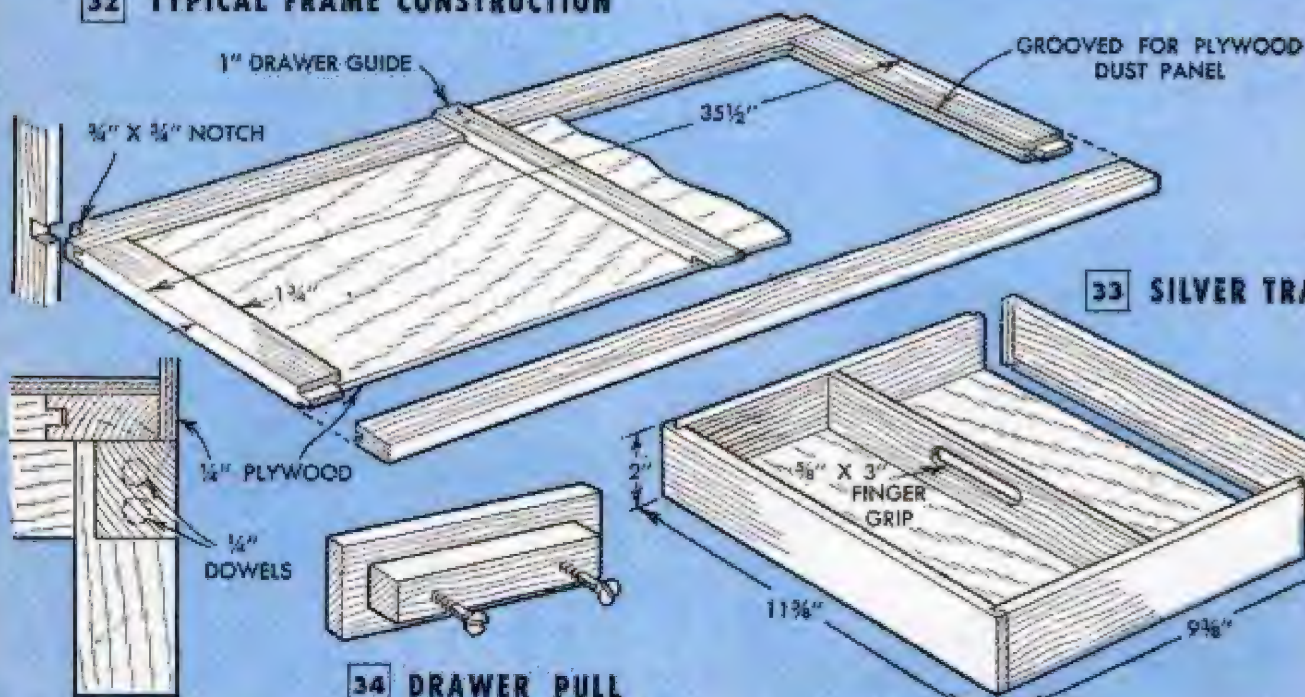
shows how the drawer frames are assembled. The top and bottom frames are supported at the front by a rabbeted molding which is mitered and assembled as a picture frame and then glued to the front edges of the frames at top and bottom. Side and top panels fit the rabbeted molding as shown in section D-D. Section C-C shows how the bottom frame is screwed to the base. Note that the top panel is rabbeted at each end to overlap the side panels. Drawers are assembled as in Fig. 30 and made to fit the openings. A grooved runner which rides on the guide is nailed to the underside of each drawer. Fig. 34 shows the simple wooden drawer pull. If desired, a silverware drawer can be included, Fig. 33. A bevel is run around the outer edges of the doors $\frac{1}{4}$ in. deep and $1\frac{1}{8}$ in. wide to give a raised panel effect.

The top unit of the cabinet is made like a box from $\frac{3}{4}$ -in. plywood. Sections A-A and B-B show how the pieces are rabbeted at the front edge to receive a molding which covers the laminations. Note that the rabbets at the top and bottom are made wide enough to house a standard showcase door track (see section A-A) and that rabbets also are made along the sidepieces to provide end grooves for the sliding glass doors. Note in section B-B that a groove is run at the front and back edges of the sidepieces for a standard adjustable shelf pilaster. In ordering glass panels for the doors, notice in section A-A that they must be short enough to permit inserting in the top track and then down into the lower one. Use crystal glass as it is less expensive. Any glass shop can grind the finger grips.



The china cabinet makes the seven-piece group complete. Featuring sliding glass doors, it's designed as two separate units to simplify moving and to permit base alone to be built and used as dinette server

32 TYPICAL FRAME CONSTRUCTION



U. I. '51

Milk Carton Provides Road Flare For Changing Flat Tire



If you have to stop on a darkened highway to change a flat tire, burn an empty milk carton to warn approaching motorists and also to furnish plenty of light to facilitate working. One of these wax-paper flares will usually burn long enough to allow you to complete the job but, just in case, wash out a couple of the cartons and store them in a corner of the car trunk.

Fulton H. Travis, Yakima, Wash.

Pocket Sewing Kit Improvised From Dental-Floss Container

Needles, thread, small safety pins and straight pins are carried compactly in a pocket sewing kit improvised from a dental-floss container. A piece of cellulose tape



on the inside of the container cap keeps the needles from slipping out, and the tiny lips on the outside of the cap are handy for cutting thread.

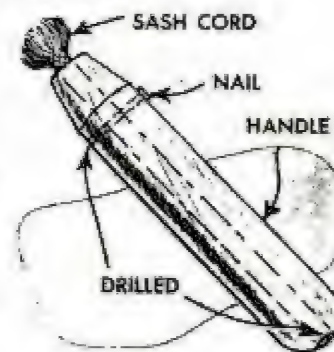
Bookmark Indicates Exact Line

Made of heavy paper or thin sheet plastic, this novel bookmark has a movable line guide that indicates the exact spot where reading was interrupted. The top of the bookmark is folded to slip over the edge of the page and the bottom is cut in the form of a large half circle to keep the line guide from slipping off. The guide is simply a small piece of paper or plastic pointed at each end and slotted to slide along the marker.



Ever-Ready Glue Brush

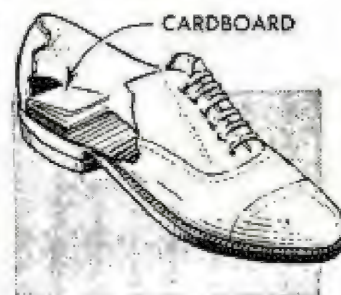
You won't have to search for a usable glue brush or take time to clean one that has hardened if you use this handy applicator. It's ready in just the time it takes to pull a piece of sash cord a half inch or so out of a wooden handle and then cut off and fray out the end of the cord. The handle is a piece of broomstick which is drilled lengthwise through its center for the sash cord. The latter is held in place with a nail pressed through a small hole drilled through the side of the handle.



Stanley R. Welling, Racine, Wis.

Cardboard Relieves Sore Feet

When breaking in a new pair of shoes, my feet usually develop sore spots at the tops of the heels. Now, when this happens, I relieve the pain by inserting a folded piece of cardboard under the heel of my foot. This lifts the foot slightly, raising the sore spot above the point of contact.



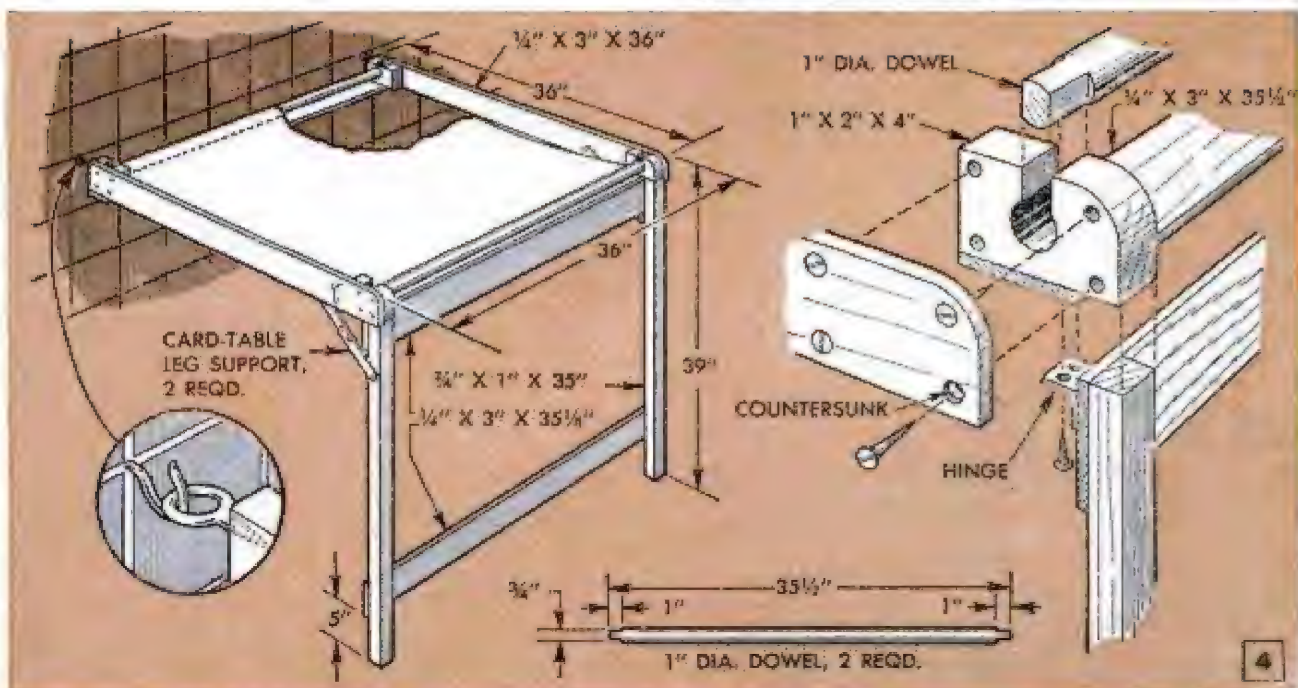
W. F. Schaphorst, Newark, N. J.



DRESSING TABLE for BABY

MOTHER and baby alike will appreciate the convenience of this simple dressing table. It swings down over the bathtub as in Figs. 1 and 2 and folds against the wall as in Fig. 3. Use hardwood as the strength of the unit depends on rigidity of the joints. Follow constructional details in Fig. 4. Note that the canvas top is supported by two 1-in. dowels which pass through hems sewed in the fabric. Flats on the ends of the dowels permit them to drop into slotted sockets. Attach the unit to a tiled wall by first drilling small holes in the cemented joints and inserting expanding fiber plugs. Then turn screw hooks into the plugs. After screw eyes at the rear corners of the table have been placed over the hooks, close the hooks with pliers so the screw eyes cannot slip out.

Jens Bastholm, Odense, Denmark.



Better performance from HEATING SYSTEMS

By E. R. Haan



Before starting the automatic gas-heating plant, see that unit is thoroughly clean and that mechanism has been checked over by a competent serviceman

When the oil-fired heating plant is idle during summer months, fuel and electrical supplies are shut off. Check and lubricate working parts before starting



ALL HEATING PLANTS, including modern automatic units, require regular attention to keep them operating efficiently and economically. Minor repair and servicing at the beginning of the season can prevent service interruptions and even breakdowns during the peak heating load of the winter months and also will help to prevent fuel waste and costly repair over longer periods of time.

Gas-fired heating units: Gas-fired systems require very little attention other than annual cleaning and inspection and a periodic check to see that the correct ratio of the air-gas mixture is maintained. Usually expert servicemen from the local utility company will attend to this adjustment for a nominal charge, but keeping a check on certain operating details is up to the individual owner. When starting a gas burner, the pilot light is ignited immediately after the gas has been turned on. (Caution: Never allow unburned gas from the pilot to accumulate in the flame chamber before igniting it. If this should happen, shut off the gas to the pilot and open the drafts and inspection door and allow time for the unburned gas to dissipate.) If the pilot burner cannot be reached conveniently with an ordinary match, use a piece of newspaper rolled up tightly to form a lighting torch 8 to 10 in. long, Fig. 1. Water vapor—one of the products of the combustion of gas fuel—unites with other waste products in the flue gases to form an acid which attacks the mortar joints in unlined brick chimneys. Because of this, vitreous-enameled or stainless-steel flue linings should be installed in old chimneys to prevent rapid disintegration.

Oil-fired heating units: When the unit is idle during summer months, the fuel and electrical supplies should be shut off. The fuel tank is filled to prevent moisture in the air from condensing in the tank during temperature changes. Water in the oil may interfere with the operation of older-type burners. When the burner is correctly adjusted, the oil-air mixture will burn with a clean, bright flame resulting in a minimum loss in the flue gases and negligible deposits of coke and soot on the walls of the flame chamber and flue. Among the

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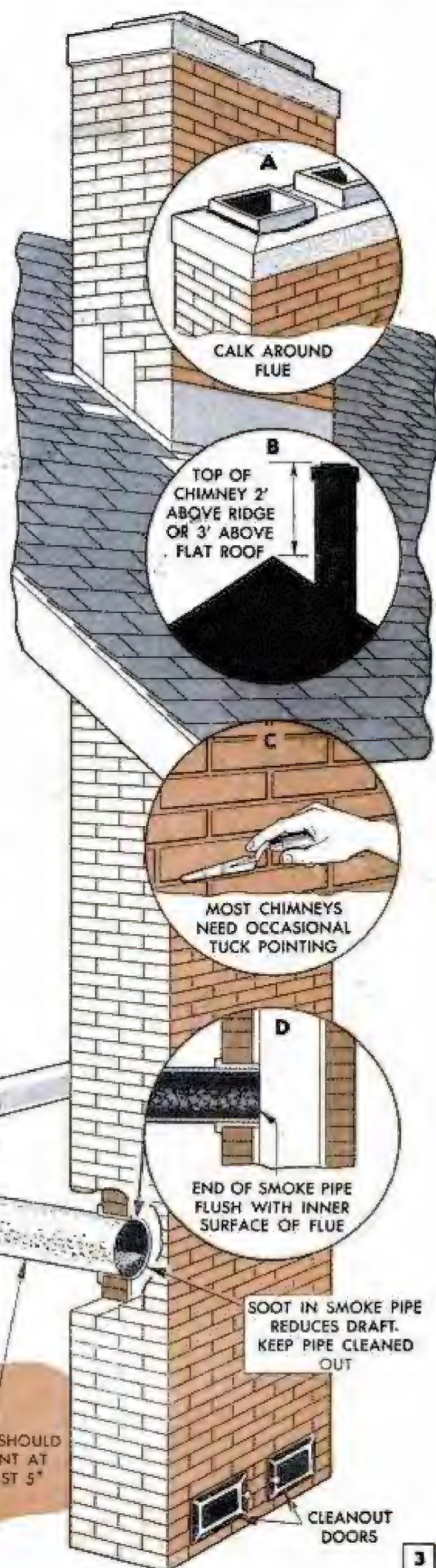
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Although a competent serviceman should be called to inspect and make any major adjustments and repairs necessary to ready your heating plant for the coming season, there are a number of minor adjustments and points to check on automatic units that you can do yourself

several causes of a smoky, stratified flame are insufficient air, flame chamber too small, or burner nozzle projecting too far into the chamber. Too much air may extinguish the flame entirely or cause objectionable sputtering and roaring while the burner is operating. Inadequate draft control also can cause similar symptoms. All moving parts of the burner requiring lubrication should be carefully checked at the start of the season and inspected at regular intervals thereafter, Fig. 2.

Coal stokers: To avoid recurring trouble with a stoker, it is important to use coal of the recommended grades and lump sizes. High-grade stoker coals contain the minimum of noncombustible materials and are mixed with large and small particles in the proper ratio to quantity. If the coal is too fine, air passage through the retort will be restricted and the combustion process retarded. On the other hand, unduly large lumps may bridge at the bottom of the hopper and either jam the feed screw, causing the shear pin to break or the clutch to disengage, or may block off the supply of fuel to the retort entirely and cause the fire to go out. Other than use of the proper grades of fuel, servicing of the stoker-fired plant is simple. Fly ash and soot are cleaned regularly from the furnace or boiler as in Figs. 5 and 8. Removal of the clinker usually is daily routine. Beyond this, a stoker fire should be disturbed as little as possible.

Hand-firing: In addition to firing by approved hand methods, economical operation of the plant



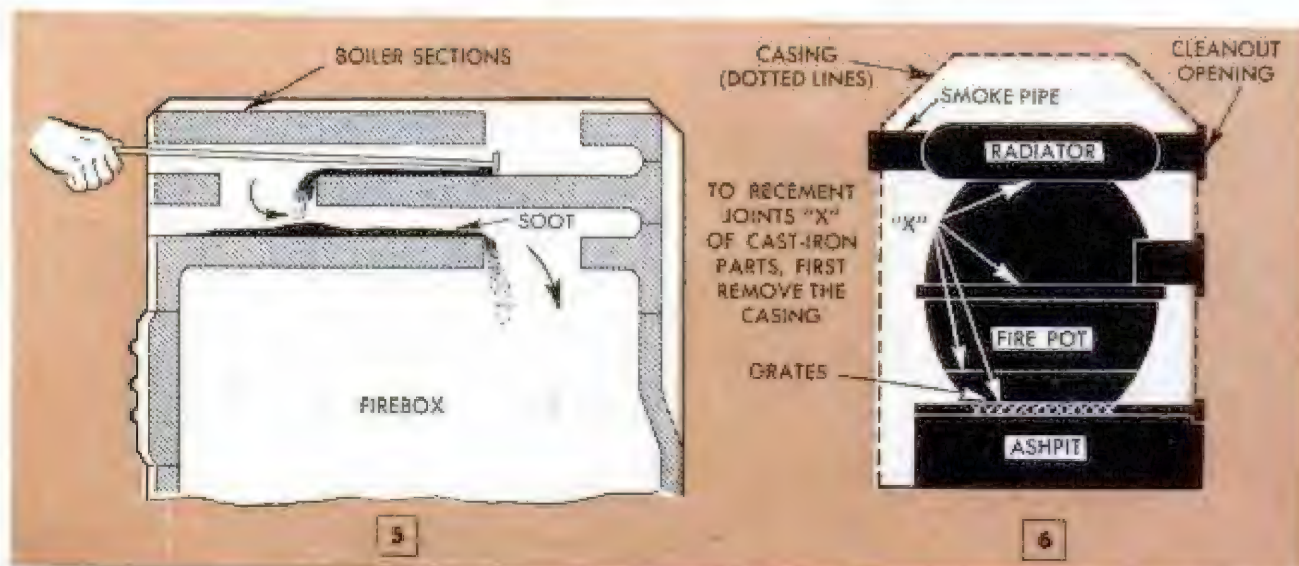


depends on keeping the equipment in serviceable condition. All doors into the furnace either above or below the fire should close tightly. If necessary, tighten up the hinge pins and file or scrape the meeting surfaces of doors and frames to reduce air leaks to the minimum. An excessive air leak around the cleanout door above the fire will act as a partial check, while leakage through the ashpit door or the draft door will make the fire difficult to control. Clean the furnace periodically throughout the heating season to prevent accumulations of ash and soot which act as insulation on heat-transfer surfaces. Check carefully at the end of the season for cracks in the firebox and for warped or cracked grates, Fig. 6.

Smoke pipe: During mild weather, the slow rate of ignition of the lower grades of solid fuels produces considerable soot which coats the inside surfaces of the

smoke pipe. As long as the pipe is hot, corrosion of the metal progresses at a very slow rate but, when the fire is allowed to go out in the spring, moisture collects in the pipe and combines with the soot coating to form highly corrosive acids. These acids quickly destroy the effectiveness of ordinary galvanized sheet-metal pipe. If a check shows the smoke pipe to be badly corroded, it should be renewed. Although much more expensive, cast-iron or stainless-steel smoke pipe resists corrosion and will last for 10 years or more. In any case, when installing new pipe be sure that the slip joints are tight and fully joined, Fig. 3, E. Use draw bands on all joints and support the pipe with metal bands or wires attached to the basement ceiling. Smoke pipe should clear woodwork by at least 15 inches.

Chimneys: To avoid draft interference, the chimney should have a separate flue for each heating unit. Unused openings into flues should be bricked up or closed with metal flue stops. Smoke-pipe joints at the chimney are closed with mortar to prevent air leakage. The end of the smoke pipe should come flush with the inside of the flue, Fig. 3, D. Top of the chimney should be at least two feet above the ridge of a peaked roof, Fig. 3, B. Remove tree branches or other obstructions to air movement above or near the chimney. Cleaning the flue can be done with a burlap bag filled with rags, straw or sawdust and a couple of bricks for weight. This "sweeper" is lowered into the chimney by means of a rope or heavy cord and worked up and down to dislodge soot and other loose particles. After cleaning the flue in this manner, remove the accumulation of soot and other debris through the cleanout door. See that the latter closes tightly. In time, mortar joints disintegrate on the part of the chimney which is exposed. Old chimneys re-



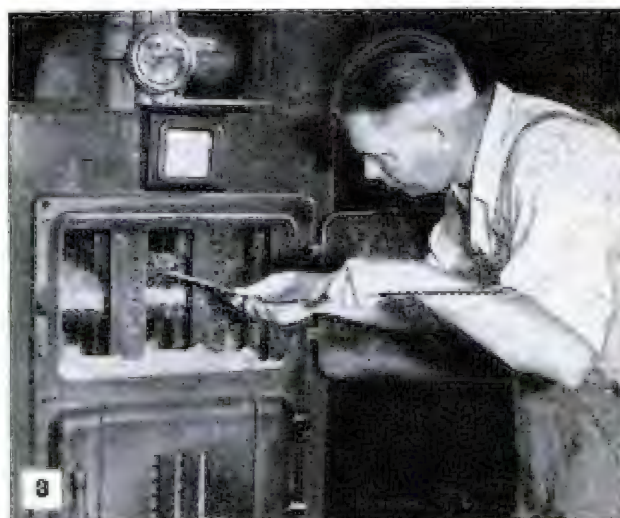
quire tuck pointing occasionally to preserve them in serviceable condition, Fig. 3, C. Loose mortar is scraped away and the open joints are soaked with water before pointing with new mortar (1 part cement to 3 parts sharp sand). The joint between the chimney cap and the projecting tile flue, Fig. 3, A, should be made watertight by calking.

Locating thermostat: The best-quality thermostatic-control units are extremely sensitive to changes in temperature and should never be located near an outside door, window, fireplace, radiator or above a lamp, Fig. 9. The best location is on an inside wall where the unit will be shielded from drafts through hallways, stairways or windows. Blow the dust out of the unit occasionally and remove the outer housing and clean the contact points as directed by the manufacturer. See that the hole where the connecting wire comes through the plaster is plugged tightly. An air leak at this point will affect the operation of the unit, possibly causing it to vary as much as 10 deg. from the true inside temperature. If the heating unit is equipped with an astat or aquastat, these units should be serviced in much the same manner. Check all electrical connections to see that they are clean and tight.

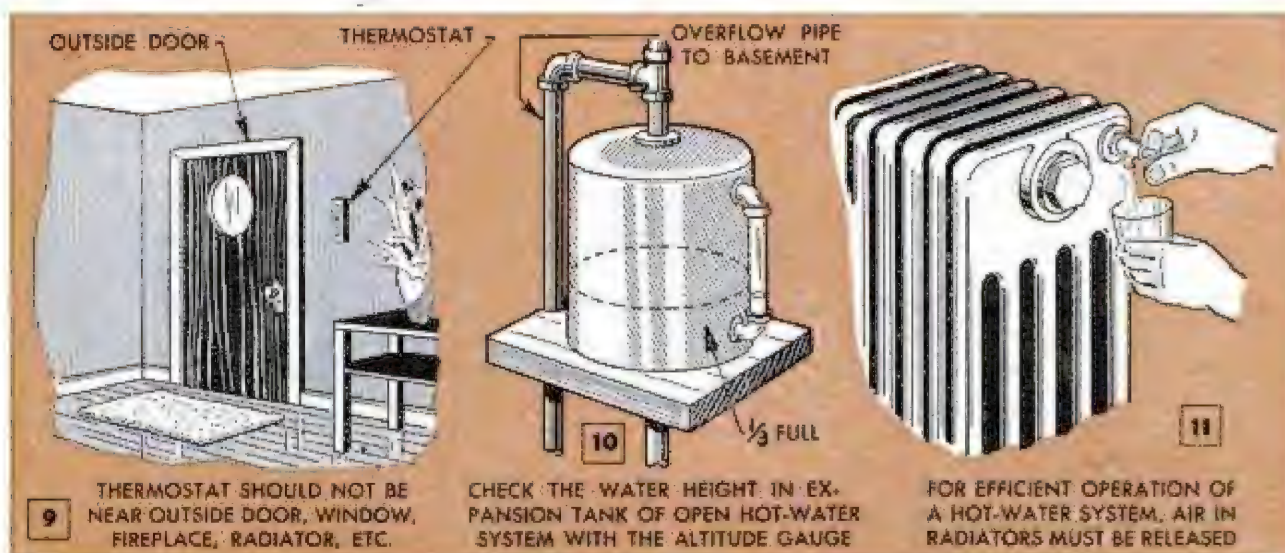
Warm-air heating systems: Unlike the older gravity warm-air systems, the late-model warm-air furnaces have forced-air circulation. Some forced-air systems bring air in from outside, but most all ordinary installations simply recirculate the air in the house as the normal air exchange in the average home is sufficient for good health. As the air is drawn through the cold-air returns, it passes through one or more filters. The renewable-type filters are replaced at least once during the average heating season. The replaceable filter should be renewed when light cannot be



Corrugated insulation on warm-air ducts stops any heat loss to the basement. Seal joints in the covering with gummed paper or cloth tape applied tightly



Heat-transfer surfaces of hand or stoker-fired boilers must be kept free from soot and fly ash. Use a wire flue brush having a flexible handle like that shown

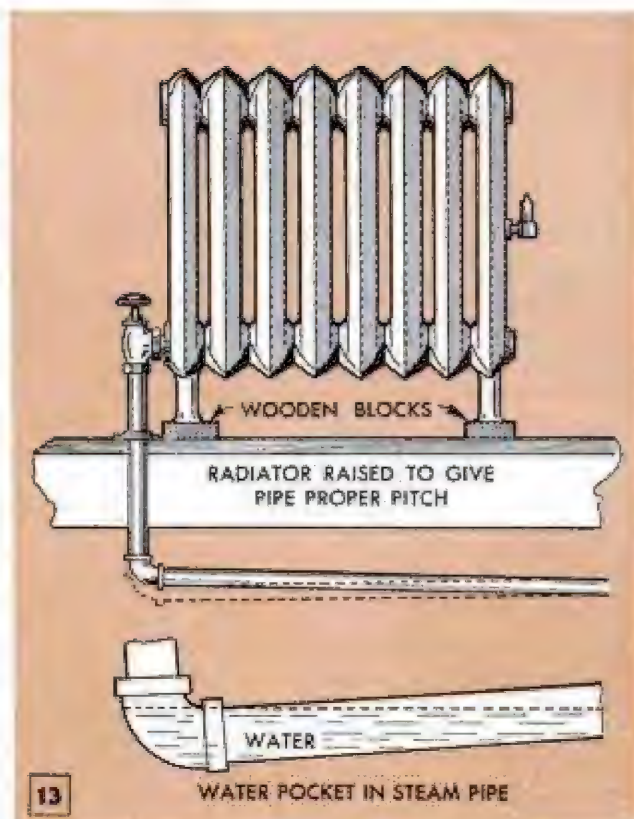




Older-type boilers should be covered with a 1-in. layer of asbestos cement which will reduce loss of heat

seen through it, Fig. 4. Joints in cast-iron furnaces, Fig. 6, should be recemented after three to five years of use. It's a simple job to remove the sheet-metal casing and lift off the separate sections down to the ashpit. Clean out all the old cement and brush dirt and loose particles out of the joints before recementing. Be sure to relocate the parts in exactly the same position. A chalk mark across each of the joints makes this easy. Excess cement forced from the joints as the parts are replaced is wiped off and the joint is smoothed with a brush or cloth. To prevent heat loss, cover warm-air ducts with corrugated asbestos paper as in Fig. 7, using gummed paper or cloth tape to seal the joints.

Hot-water systems: Do not flush a hot-water heating unit unless this is necessary in making repairs or when cleaning sediment out of the boiler. "Stale" water contains the minimum of oxygen and lime and will cause less corrosion of metal parts than fresh water. Before starting the season with a hot-water system having an open expansion tank, Fig. 10, check the water level with the altitude gauge to see that the system is full. On the dial-type gauge, the red arrow is set to the required water height and water is added until the black arrow is brought to the same height as the red arrow. On a closed-type system, the water level is maintained automatically and forced-circulation systems have automatically controlled circulating pumps.



Use blocks to raise a steam radiator and restore the drainage pitch of pipe lowered by settling of house

Air entrapped in the hot-water system impedes water circulation. Pressure is relieved by bleeding the entire system at the radiator valves as in Fig. 11. Bleeding off the air will lower the water level. Check and add fresh water if necessary. Then bleed the system again after a week or so to remove any air carried into it with the fresh water which was added.

Steam-heating systems: In the newer one-pipe steam system, a single pipe conducts live steam to each radiator and returns condensate to the boiler. When the radiators of the one-pipe system fail to heat, the cause usually is faulty air valves. Lime deposits and corrosion cause sticking of the moving parts, preventing air from escaping and steam from entering the radiator. Sometimes the faulty valves can be repaired but, as a rule, it will pay to replace them. Pounding or hammering in a one-pipe steam system usually is caused by water trapped in the radiators or somewhere in the return pipes. Settling of buildings often lowers a pipe below the correct drainage pitch and water collects in the low end beneath the radiator. Hammering is caused by steam being forced through the water in intermittent spurts. The simplest remedy is to raise the radiator on small wooden blocks as in Fig. 13. Hammering also is caused by water collecting in a steam valve that is only partly opened. Be sure the steam valves are either fully opened or closed at all times. Sediment

collects in both hot-water and steam boilers after years of use and is removed by draining and flushing the system with clean water. Never drain the boiler when it is fired. If an emergency repair makes drainage necessary, draw the fire and wait until the system has cooled to room temperature before draining and refilling. Small quantities of water can be added while the system is in operation should it be necessary to replenish the water supply, but the fire should be low and the water added slowly to avoid a sudden temperature change which might crack the boiler castings.

Vapor-vacuum systems: This type of heating plant is practically trouble-free unless air leaks develop. These can occur at the radiator and boiler valves, at the water gauge and the diaphragm joint of the damper regulator and, more rarely, at pipe connections. Operation of the system is controlled by a vacuum valve on each radiator which is actuated by steam pressure. When the pressure drops, the valve closes and prevents air from entering the radiator. Leaks in the vacuum system generally are easy to locate when the boiler is carrying a full head of steam. The method of repair will depend on the location and nature of the leak. Liquid compounds are available which are effective in sealing small leaks in both steam and vacuum-heating systems. Of course, excessive leaks at the water gauge, around valves, at the damper regulator, or in a pipe joint are permanently repaired only by replacement of the defective parts.

Insulating pipes and boilers: Long runs of both hot-water and steam pipes should be insulated to prevent heat loss with a ready-formed insulating covering as in Fig. 3. F. Asbestos cement is applied to the pipe fittings and valves. Late-model boiler units are provided with insulation, but older boilers should be coated with asbestos cement to reduce heat loss to the basement. A 100-lb. bag of this special cement will cover the average boiler of either the square or round type. Mix the cement with water to form a thick paste and trowel it on the boiler to a thickness of about one half inch. Cover this first coating with 1-in. wire mesh, as in Fig. 12, and then apply another ½-in. layer to cover the wire. Smooth the job with a wet sponge and cover with muslin or cheesecloth pressed onto the cement while it is still wet.

Radiators: As a rule, it is not advisable to cover older-type radiators in any way, as coverings tend to retard air circulation. Nor is it advisable to coat old radiators with bronzing paints, as the metallic pigments in these paints tend to overlap on drying and form a reflecting surface which retards heat transfer.

Inexpensive Power-Tool Stands From Sewing-Machine Legs



Merritt L. Beeson of Dodge City, Kans., has found a new practical use for the cast-iron framework of old treadle sewing machines. Stripped of all mechanical parts and then fitted with heavy plank tops, the frameworks provide exceptionally rigid power-tool stands which can be rolled easily when necessary to suit the particular job. Some of the frameworks were dismantled even further by removing the center bracing to permit housing a three-drawer cabinet in the base of the stand. This made it especially handy to keep related accessories near the tool mounted on the stand. Firms specializing in modernizing old treadle-type sewing machines usually will give you discarded frameworks.

Coins Taped Inside Match Book Are Mailed Safely

When sending coins through the mail, tape them to the inside of an empty match book. Use cellulose tape to secure the coins and close the cover before inserting the book in the envelope.



❏ Instead of rubbing clothes by hand when washing, use a stiff brush to remove spots. This is fast and easy on the hands.

WLM-5

FROM



CAMERA TO ENLARGER

By Walter T. Warde

INEXPENSIVE to build, the horizontal enlarger shown in Fig. 2 utilizes an old 5 x 7 or 4 x 5 view camera as a projector. It is of the semidiffused type preferred for all-purpose work, and uses 6½-in. condensers with a diffused light source. The enlarger will accommodate negatives up to 4 x 5 in. with either of the above cameras.

Construction of the light box, swinging platform and base is detailed in Fig. 1. The curved plywood lid is saw-cut, or kerfed, to permit easy bending and is glued to the bandsawed ribs. The adjustable enlarging light is made as indicated in the upper left-hand detail, the electrical pipe being passed through a "flex" fitting. Note that the cord from the light socket runs through a hole in the side of the pipe and, in Fig. 6, that the end of the pipe is fitted with a round wooden handle. The reflector for the original unit was spun on a wood-turning lathe and satin-polished with fine steel wool. However, if a lathe is not available, a polished metal dish will serve the purpose. The enlarging lamp itself is a 175-watt opal projector bulb. The holes leading to the ventilator and those in the sides of the light box are covered with sheet-metal baffles to prevent the loss of any light. An end baffle, shown in Figs. 1 and 6, fits across the back of the light box at the cover joint to prevent light leakage at this point. The

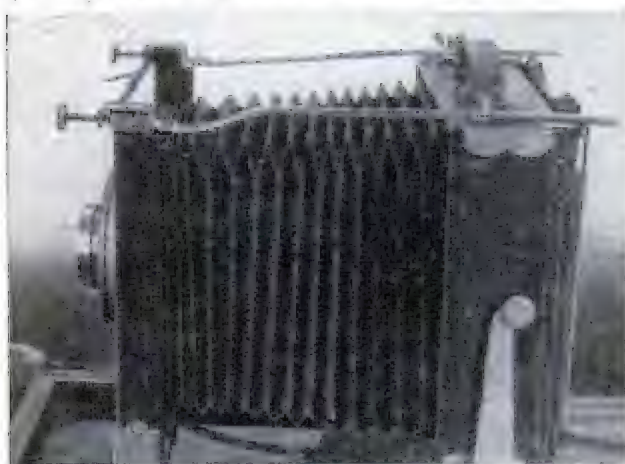
platform and base are simple box construction, using solid stock throughout.

Fig. 3 details the condenser housing, which is made in three sections. Note that the outside of the right-hand unit is pictured and that this must be turned around when it is assembled to the center section. Strips of felt about ½ in. wide are glued around the inside edges of the 6¼-in. holes and the housing is assembled with screws to facilitate removal of the condenser for cleaning. The housing is attached to the light box with brass spring clips, and felt strips between the two units help prevent light leakage. This also is offset by the wooden baffles glued to both sides of the condenser housing.

The connecting unit, Fig. 4, serves as a slide for the revolving negative carrier. This is mounted between the condenser housing and the projection camera and must be made to fit the back of the camera. The unit is merely screwed to the condenser housing but it is both glued and screwed to the camera.

The revolving negative carrier, detailed in Fig. 5, is more difficult to make than a stationary one, but the extra effort is well worth-while when it comes to making corrections between the horizontal and vertical. The carrier is made in three sections and uses a ¾ x 4 x 5-in. wooden retainer to hold the negative against a 3¾ x 4¾-in. opening cut in a 7-in. plywood disk at the

Clamps Hold Camera Back Rigid For Color-Separation Work



This adjustable clamp, which is made from tripod stays or braces, holds the back of a view camera rigid when it is necessary to make several color-separation negatives. The slotted arms of the stays are clamped securely to the front of the camera. Then, after focusing, thumbscrews turned into the top of the camera back are tightened over the slotted arms. This locks the back and the lens board in the same relative position and keeps the negatives in exact register.

Godfrey Lundberg, Winnetka, Ill.

Receptacle Box Has Toggle Switch To Control Photoflood Lamps

When using two photoflood lamps, many steps can be saved by turning them on and off simultaneously with a single toggle switch located conveniently near the camera. The unit is compact and inexpensive, consisting merely of a duplex receptacle fitted with a standard toggle switch and a length of power cord. A slot for the switch and a hole for the cord are cut through the



sides of the receptacle box. Then, the power cord is wired through the switch.

Richard C. Collins, Jr., Elizabeth, N. J.

Permanent Darkroom Thermometer Indicates Solution Temperatures

By immersing a thermometer in water and keeping it in the darkroom, the temperature of the photo solutions stored in the room can be noted at a glance. Although the thermometer shown is placed in a graduate, it is best to immerse it in a jar filled with water. The jar can be capped tightly so the water will not evaporate. Accurate readings are had if the thermometer is set on the same shelf, or at the same level, as the solutions.

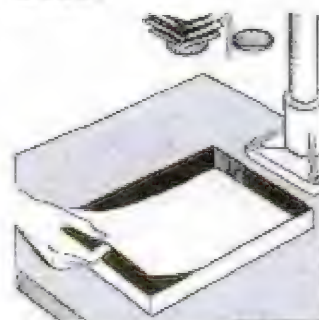


Borderless Prints Made Quickly With Improved Easel

A fast way of making borderless prints with an enlarger is to use an empty printing-paper box for an easel. Thumbtacked to the enlarger base, the box automatically positions the paper.

To avoid possible flare, paint the inside edges of the box a dull black and, to aid in removing the exposed print, cut a finger notch in the front of the box.

Virginia Hanson, Santa Monica, Calif.



Flash-Extension Plug Jacks Taken From Radio Tube

If you don't have a pin-type plug for a flash extension at hand, you can improvise one by using the prongs from a discarded radio tube. Just remove two prongs from the tube base and solder them to the ends of the extension wire. The jacks shown in the photo are fitted with finger grips made from hollow rivets.—Kenneth Murray, Colon, Mich.



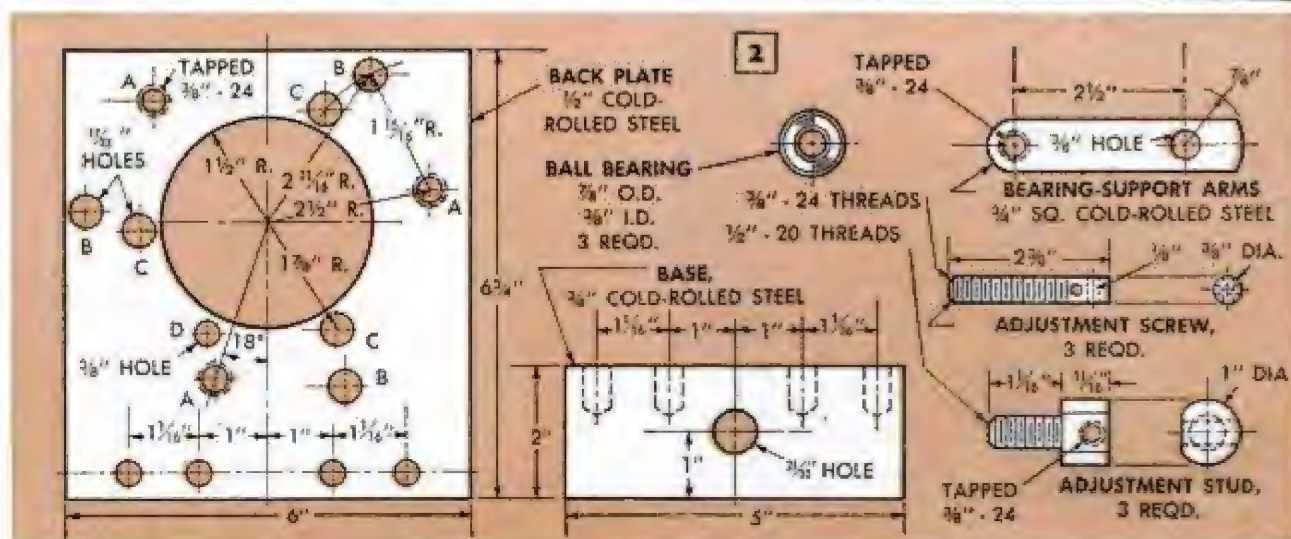
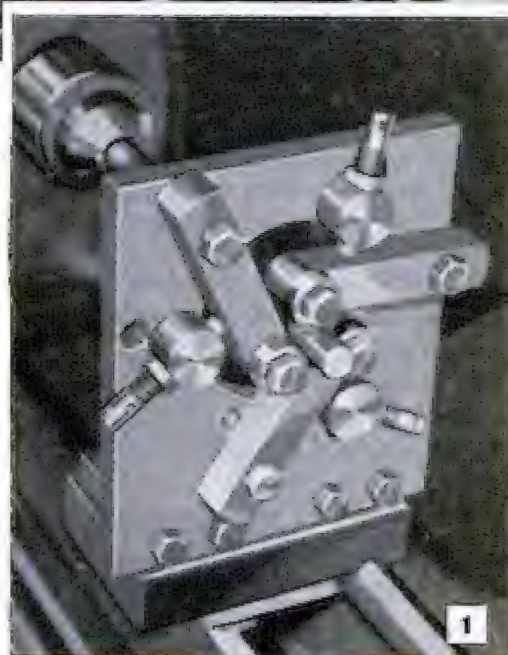
SHOP NOTES

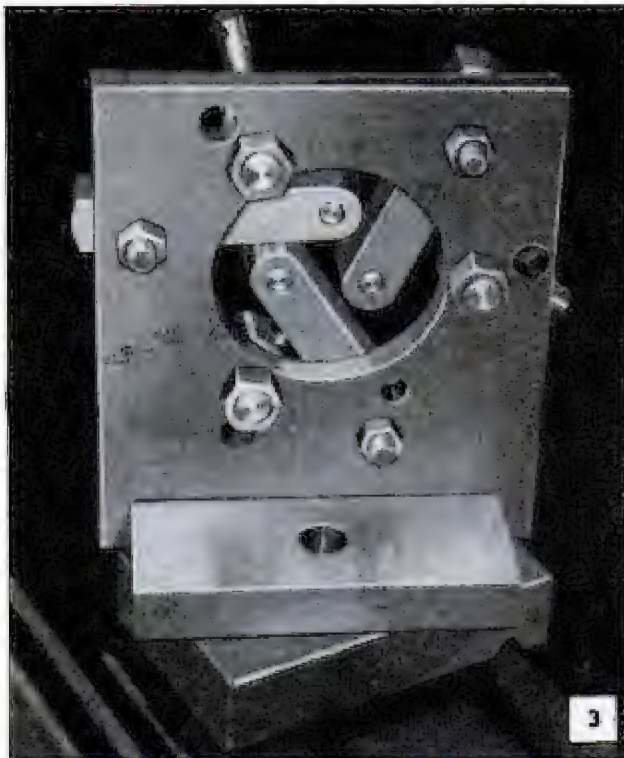


Ball-Bearing
CENTER REST

By P. F. Fink

TWO SPECIAL features make this ball-bearing center rest outstanding in performance, particularly on work of small diameter. Location of the bearing-support arms provides a clamping action on the work which does away with troublesome chatter, and the rolling contact of three ball bearings eliminates friction and scoring. Adjustment screws, running down on the bearing-support arms, Fig. 1, provide a delicate slow-motion movement





for centering the work and also adjusting bearing pressures to just the right degree. Once the work is in position, jam nuts on the screws are tightened to hold the adjustment. It has been found that an adapter plate, or subbase, of hardwood serves as well as, or better than, one of metal. This eliminates the necessity of milling a V-groove in a metal subbase. The V-groove is easily sawed in a wooden block. Length of the wooden subbase should be sufficient to cross both the V-way and the flat way of the lathe bed as in Figs. 1 and 3. When assembled, the rest is clamped in position on the lathe bed by a $\frac{5}{8}$ -in. bolt which passes

through the base, subbase and through a $\frac{1}{4}$ -in. steel clamping plate, as in Fig. 1. These parts are not detailed, as they must be made to fit the lathe on which the rest is used. Locate the center of the 3-in. hole through the back plate and then lay off and prick-punch centers of holes A, B, C and D, Fig. 2. Lay off, punch and drill the four holes at the bottom of the plate for the $\frac{3}{8}$ -in. cap screws with which it is attached to the base. Drill holes A, B, C and D and tap holes A. Then bolt the work to the lathe faceplate, blocking out for clearance and inserting the faceplate bolts through hole D and through hole C near the top of the plate. Center the plate and bore the 3-in. work hole through it. Break, or chamfer, the corners of the hole after boring so that the sharp edges do not cause injury. Drill and tap the base as detailed and bolt the parts together. Making the bearing-support arms is a simple drilling, tapping and filing job, but the adjustment studs should be turned and threaded in the lathe, after which they are drilled in a V-block and tapped. File or grind a flat on each stud to provide a seat for the jam nut on the adjustment screw. Note that two $\frac{1}{8}$ -in. holes are drilled transversely at 90 deg. through the end of each adjusting screw. In use, a small pin is inserted in these holes to tighten or loosen the screws when making adjustments. When the clamping studs are placed in the holes C, Fig. 2, the adjustment will provide for work from $\frac{1}{2}$ to 1 in. in diameter. When the arms are moved to the holes B, the adjustment range is from 1 to $2\frac{3}{4}$ in. in diameter. Ball bearings preferably should be of the grease-sealed type which are dustproof and do not require periodic lubrication.



Lettering Truck Doors Speeded With Paper Pounce Pattern

Lettering truck doors can be done more quickly if the spacing layouts are made with perforated paper patterns. Several standard layouts are sufficient to handle most any job requiring only plain lettering. The lines are drawn on heavy paper and the perforations are made with a sign-painter's pounce wheel or a dressmaker's wheel. Then the back side of the paper is sanded to remove the waste from around the holes. In use, the pattern is taped in position on the door and the layout is pounced with a bag of powdered whiting or talcum powder. In addition to saving time, this also protects the paint of the truck.

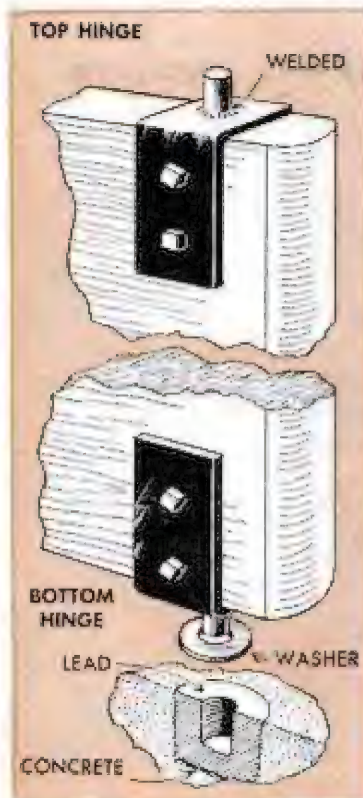
Elmer Vandrey, Truman, Minn.

¶ An ordinary salt shaker is a handy dispenser for applying lice powder to cattle. Use a large metal shaker for this purpose.

#1C-51

Hung with these novel pin-type hinges, garage doors not only may be swung both inward and outward but they can be lifted slightly for the full length of the door. This permits them to be opened outward even though there is a thin layer of ice or packed snow on the driveway. As the hinges are simply pivot pins attached to the top and bottom of the door and inserted in holes in the top jamb and sill, the weight of the door will not cause sag. Each hinge is made simply by welding a short length of $\frac{5}{8}$ -in. rod to an angle bracket. The latter, which should be $\frac{1}{8}$ in. thick or more, can be either cut from angle iron or bent from flat iron. The top hinge pin is inserted in a hole drilled in the doorjamb header, and the bottom

Pin-Type Hinges for Swinging Garage Doors Prevent Sag and Permit Lifting to Clear Ice



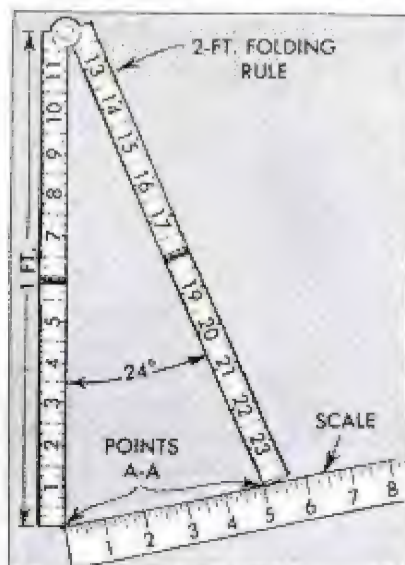
pin fits in a lead-lined hole in the concrete sill. After a square hole is chipped in the concrete, the end of a length of rod is wrapped with paper. This is centered in the hole and held slightly above the bottom while molten lead or Babbitt metal is poured into the hole. When the metal has hardened, the rod is removed from the hole, leaving a bearing surface for the hinge pin and also for a metal washer on which the angle bracket rotates. Before hanging a door, insert the upper hinge pin in the hole in the jamb header and hold it

in place with tape. Then, screw the bottom hinge to the door, slip the washer over the pin and lower the pin into the hole in the sill. Using wooden wedges to prop the door in position, fasten the upper hinge bracket to the door. Note that the hinged edge of the door is curved to a radius so it does not bind, and also that some space must be allowed between the upper hinge bracket and the jamb to permit lifting the door when it is necessary to clear ice or snow. Apply a little chassis lubricant to the hinge pins to prevent rusting.

Paul Gardner, Seal Rock, Ore.

#1C-51

Improved Protractor Formed by Combining Folding Rule With Inch Scale



POINTS A-A	ANGLE
2 $\frac{3}{32}$ "	10°
3 $\frac{1}{16}$ "	15°
3 $\frac{1}{8}$ "	16°
3 $\frac{3}{16}$ "	17°
3 $\frac{1}{4}$ "	18°
3 $\frac{5}{16}$ "	19°
4 $\frac{1}{8}$ "	20°
4 $\frac{1}{4}$ "	21°
4 $\frac{3}{8}$ "	22°
4 $\frac{1}{2}$ "	23°
5"	24°
5 $\frac{1}{16}$ "	25°
5 $\frac{1}{8}$ "	26°
5 $\frac{3}{16}$ "	27°
6"	29°
6 $\frac{1}{2}$ "	30°
8"	39°
10 $\frac{1}{8}$ "	50°
12"	60°

If a job requires laying out angles and you do not have a protractor handy, you can determine the angles with a 2-ft. folding rule and a scale. Just measure the distance between the inside edges of the folding rule when it is folded at an acute angle. Checking the measurements with the above table will give you the angle at which the rule is set. It is a good idea to memorize three or four of the more important angles and their corresponding dimensions on the rule, such as, 15 deg.— $3\frac{1}{8}$ in., 30 deg.— $6\frac{7}{16}$ in. and 60 deg.—12 in.

☛ To keep birds from eating grapes, place a length of black garden hose in the vines. The length of hose, which looks like a snake, will frighten away the birds.

Sturdy Wheel Bench for Farm Shop Made From Old Wagon Tires

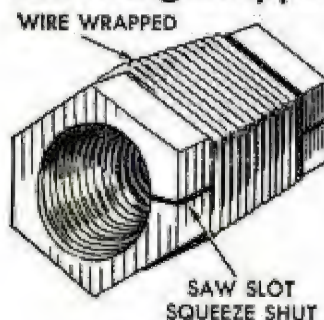


Although it was originally made for use when setting metal tires and repairing wooden wagon wheels, this sturdy wheel bench has other uses in the farm shop. It's made entirely from old wagon wheel tires bent and welded to form a skeleton top, four legs and a bottom brace. The legs can be welded to the top members and brace, or they can be bolted in place to permit dismantling.—Charley Cole, Graham, Ala.

Acetone Aids Drying Glassware

To dry laboratory glassware quickly, rinse with acetone after washing. The acetone evaporates rapidly leaving a dry surface, and the excess that drains off the glass can be retrieved for future use. Remember to keep the acetone away from an open flame.—Helen Lemberger, Chicago.

Renewing Stripped Brass Fittings



When threads of a brass fitting on an engine gas or oil line are stripped, it is, of course, best to obtain a new fitting. However, if a replacement of the proper size cannot be found, the old fitting can

be repaired for further service. To renew the fitting, cut it lengthwise with a hacksaw and squeeze it to close the slot. Then bind the fitting neatly with brass wire and

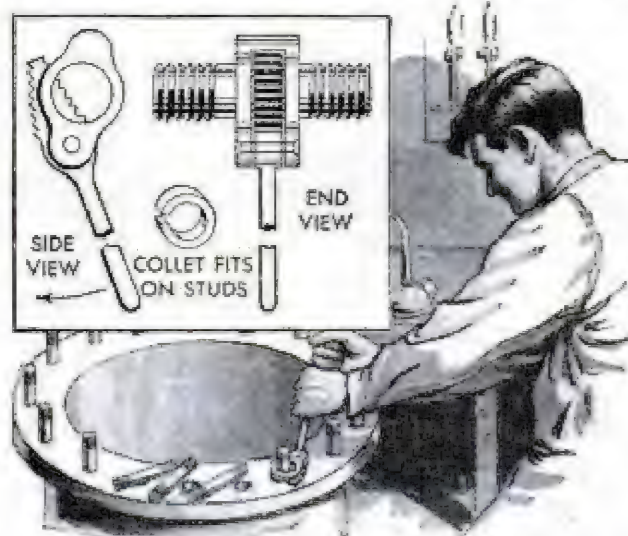
sweat-solder it in place. If the wire is wrapped carefully, a wrench still can be used for tightening and removing the fitting.—Ed Packer, Chicago.

U-Shaped Rod Prevents File Nicks When Sharpening Cordwood Saw

File nicks in the gullets between the teeth of a cordwood saw often are responsible for cracks and breakage. Slipping a U-shaped rod into the gullet will effectively prevent the file from nicking the adjacent tooth.—G. E. Hendrickson, Argyle, Wis.

Ratchet-Grip Stud Wrench Does Not Mar Surface

Removing or installing heavy studs without leaving wrench marks on the unthreaded sections is no trick at all with this special ratchet-grip wrench. The wrench consists of only three parts and can be made any suitable size. A single piece of tool steel slotted through and shaped in profile as indicated in the side view above forms the swinging jaw. The ratchet jaw, which is part of the handle, is notched on



both sides at the flattened end and both the swinging and ratchet jaws are drilled for a pivot pin. The diameter of the large hole through the swinging jaw ordinarily should be about twice that of the stud. After drilling and fitting the parts with the proper clearance, both parts should be hardened to prevent burring while in use. In assembling, peen both ends of the pivot pin. The collet is made from brass tubing of an inside diameter slightly larger than the diameter of the stud. To use the wrench, the collet is first slipped over the stud and the wrench jaws are opened and placed over it. Swinging the ratchet jaw of the wrench causes the collet to grip the body of the stud tightly.

Louis E. Lebovitz, Burlington, Vt.



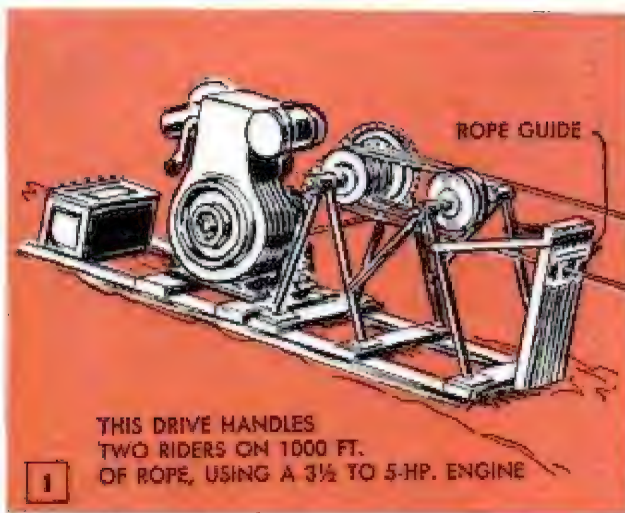
PORTABLE SKI TOW

By Eugene M. Hanson

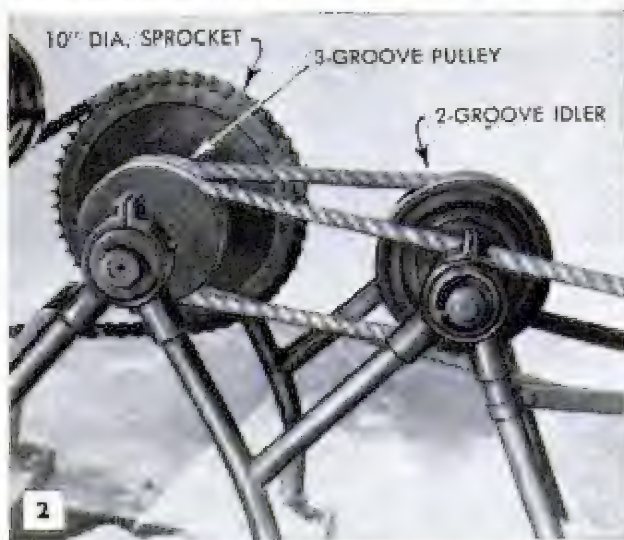
A PORTABLE ski tow that can be set up for a group of skiers wherever and whenever skiing conditions are best takes care of the uphill transport problem at a minimum cost. The power unit, Fig. 1, is mounted on skids so that it may be either blocked or bolted onto an ordinary toboggan for easy transport over soft snow. In use, the unit is anchored on the slope and the endless loop of $\frac{1}{2}$ -in. rope is unrolled down the hill to its full length. Flanged sheaves, Fig. 4, already on the rope, are

Photos by Cecil Charles





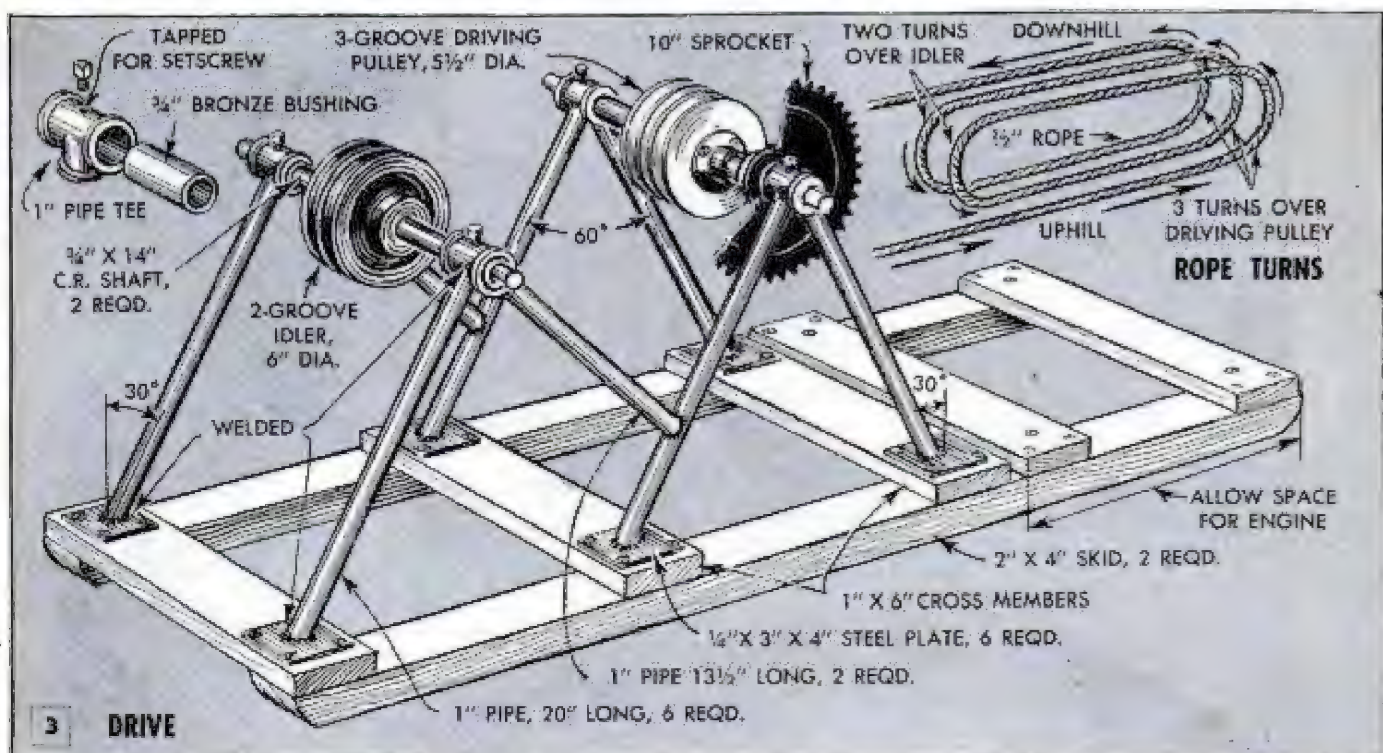
The self-contained power unit is mounted on skids which can be bolted or blocked on ordinary toboggan

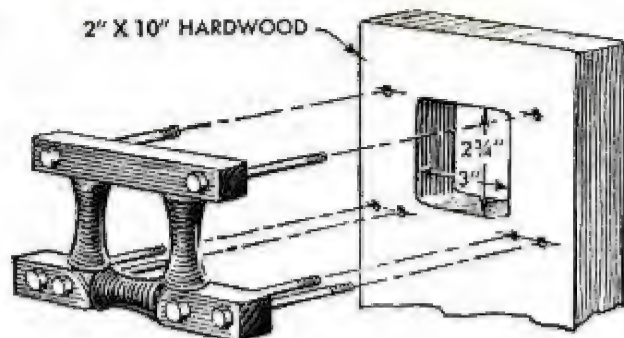


Rope-drive mechanism is arranged to give double purchase in manner quite similar to a tackle block. This type drive prevents slippage and fraying of rope

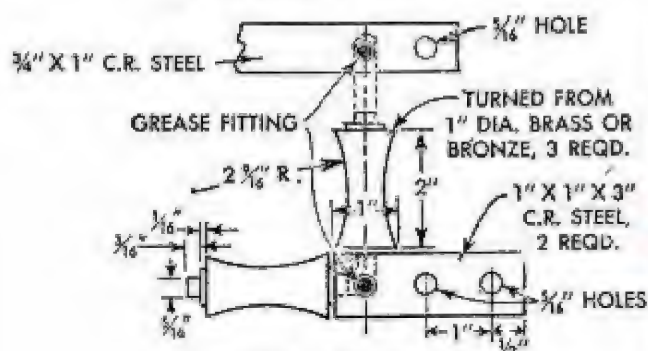
attached to trees that happen to be fairly close in line. A single sheave at the looped end of the rope is spring-tensioned to take up excessive slack, thus preventing long sections of the rope from dragging in the snow and increasing the load on the engine. The rope drive is arranged as in Figs. 1, 2 and 3 to give a double purchase over V-pulleys in a manner similar to that of a tackle block, eliminating slippage even when the rope is snow-covered. Coating the rope with pure beeswax protects it from rapid deterioration and fraying. Driving from a 2-in. sprocket on the engine through a roller chain to a 10-in. sprocket on the rope drive gives the tow a moderate and safe rate of travel. Of course, a V-belt drive also will operate satisfactorily and is somewhat less expensive.

The drive-shaft and idler-pulley assemblies are carried on a double A-frame made up from 1-in. pipe as in Fig. 3. Lengths given for the various pieces of pipe required are only approximate as some grinding and filing will be necessary in fitting the parts preparatory to welding. Pipe tees are turned tightly onto four of the slanting uprights, two of the short ones and two of the long ones. Ends of the four remaining uprights are filed to fit the contour of the tees so as to form a rigid welded joint. The tees are reamed for bronze bushings and each is drilled and tapped for a setscrew which holds the bushing in place. For convenience in lubricating the bearings, each one should be provided with a grease fitting. Collars placed either inside or outside of the bearings take up any end play in the shafts. The lower ends of six of the slanting uprights are welded to pads cut

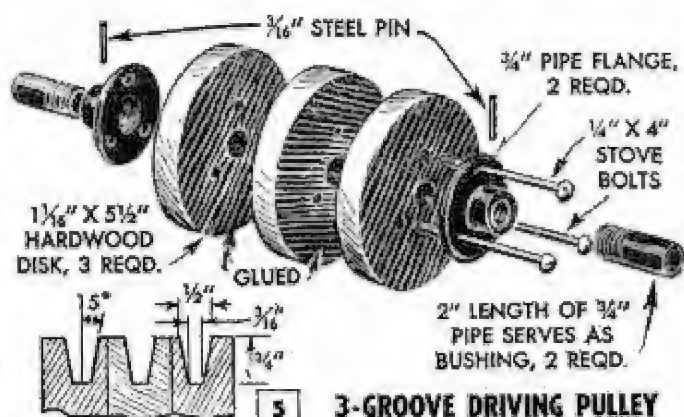




ROPE-GUIDE ASSEMBLY



ROPE-GUIDE DETAIL



3-GROOVE DRIVING PULLEY

from $\frac{1}{4}$ -in. steel. The pads are drilled so that they may be screwed or bolted to the wooden cross members of the skid frame. When assembling, be sure that the shafts are parallel and that they turn freely in the bearings. It may be necessary to bend the supports slightly to align them after welding has been completed.

Fig. 5 details the rope guide and the 3-groove driving pulley. Both are simple lathe jobs. Three $1\frac{1}{16}$ -in.-thick hardwood disks are glued together to get the required width for the 3-groove pulley. After turning and grooving in the lathe, the pulley is center-drilled for the shaft and also for three stove bolts, equally spaced. These bolts pass through $\frac{3}{4}$ -in. pipe flanges which form the pulley hub. Short lengths of $\frac{3}{4}$ -in. pipe screwed into the flanges serve as bushings to true the pulley on the shaft. Note that both flanges are pinned to the shaft. The pins pass through the flange, pipe



bushing and shaft and should be a fairly tight, drive fit. The rope guide is assembled from short lengths of cold-rolled steel, a length of 2 x 10-in. hardwood and three rollers turned down from 1-in.-dia. brass or bronze. Two of the rollers are mounted vertically and one horizontally as shown in Fig. 5. It will be necessary to turn the rollers to the dimensions given as these are not stock items. All three are identical in size. Install grease fittings in the positions indicated so that the rollers can be adequately lubricated. Use a $3\frac{1}{2}$ to 5-hp. engine of the self-contained air-cooled type. In setting up the unit for use for the first time, lead one end of the rope through the guide, over the pulleys as in Fig. 3 and through at least three flanged idler sheaves, Fig. 4, and the spring-tensioned end sheave around which the loop passes at the bottom of the slope. Then splice the rope in an approved manner to make a smooth splice that will pass through the sheaves and over the driving pulleys. Locate the tow so that skiers coming up on the rope can release it and ski away on snow which is fairly level.

Corners Cut From Cardboard Box Align Paper When Stapling



Stapling together sets of printed forms or instruction sheets is speeded considerably if the sheets are sorted and aligned for stapling in the same operation. This can be done simply by placing the sheets in a jig made from cardboard box corners. The corners are cut as indicated, spaced so they will contain the sheets in a neat pile and fastened to the table top with thumbtacks.

Opie Read, Jr., Chicago.

Wooden Wheels on Farm Wagon Adapted for Rubber Tires

One farmer converted the wooden wheels on his wagon to rubber-tired ones at little cost. He obtained some old auto-wheel



rims and cut off the wagon-wheel spokes to the same diameter as the inside of the rims. After drilling the necessary holes through the rims, he fastened them to the spokes with wood screws.

A. M. Wettach, Mt. Pleasant, Iowa.

Concrete Splash Block Under Pump Keeps Well Platform Dry

To keep a well platform dry, one farmer set a concrete splash block directly below the pump spout. The center of the block is concave to form a bowl and the water is drained through a length of pipe entering the bottom of the bowl. The block



can be cast in a mold dug in the ground, a mound being left in the center of the hole to form the concave portion of the block. After the concrete has set, the block is lifted from the mold and is ready for use.

Baiting Coyote Traps

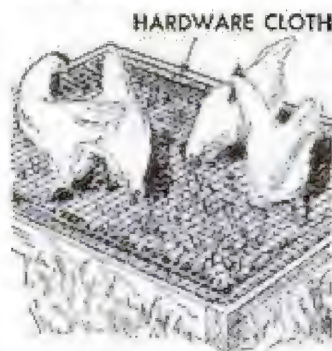
When the bait for a coyote trap is placed on the ground, the clever animal often evades the trap and steals the bait. To overcome this, some trappers hang the bait from a tree limb so it is directly over the trap and almost out of the coyote's reach. This forces the animal to jump several times for the bait and, in doing this, he will usually step into the trap.

William Allen Ward, Dallas, Tex.

Green Feed Grown in Poultry Yard Protected With Hardware Cloth

Small grain sown in a cultivated section of the poultry yard will continue to produce green feed for some time if the planted area is protected with a hardware-cloth screen immediately after sowing.

The hardware cloth is stretched across a wooden frame made from 1 x 4-in. stock. This keeps the chickens from scratching up the seed before it has had time to sprout, and also permits the poultry to eat only that portion of the feed which grows above the wire screen.



CHASSIS CHATTER

Giant C-Bracket on Chain Hoist Speeds Installing Truck Engine

Made from old plow beams, this adjustable C-bracket simplifies engine removal and installation in cab-over-engine trucks. The arms of the bracket are bolted together with steel plates or lengths of angle iron, the distance between them depending upon the height of the cab over the engine opening. The hoist can be moved along the upper arm to balance engines of varying weights and sizes, and the lower arm is bolted to the top of the engine.

L. H. Houck, Jefferson City, Mo.

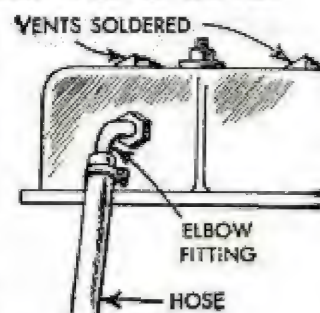
Oilcan for Priming Carburetors Has Special Safety Features

To introduce gasoline into a carburetor after an engine overhaul, one mechanic uses this specially fitted oilcan to do the job safely. First, a piece of very fine mesh copper screening is soldered over the threaded end of the spout to prevent possible flash back. Then, to make sure no one tries to oil machinery with gasoline, a cotter pin is soldered over the small end of the spout. This prevents the spout from being inserted in an ordinary oilhole. Finally, the can is painted red as a warning.



Fumes Piped From Valve Cover

Exhaust fumes escaping from the vents in the overhead-valve cover were seeping into my car causing considerable annoyance. I corrected the trouble by soldering the vents closed and piping



the fumes to the underside of the car. A 90-deg. elbow fitting mounted in the side of the valve cover toward the rear of the engine permitted attaching a 4-ft. length of garden hose. The hose was clamped to the fitting and the free end wired to the car frame.—W. F. Kearney, Seattle, Wash.

Keeping Spark-Plug Contacts Clean

If you twist spark-plug caps several times whenever the hood is raised, the contact surfaces will remain clean, insuring the delivery of full current to the plugs.—R. Hertzberg, Jackson Heights, N. Y.





1
Arc welding offers a quick and economical method for making repairs on automobile and truck frames

ARC WELDING for beginners

By A. E. Youngquist

PART 1



2
Above, repairing spring-tooth harrow with 180-amp. a.c. welder. Below, using portable d.c.-type welder for on-the-spot repairing of tandem disc harrow



METALWORKING industries have for many years used electric arc welding as a means of fabricating metal parts. Recently this fast and economical method of joining metal has been made available to the home craftsman, job shop, garage owner and farmer in the form of small arc-welding machines, which cost no more than average home-workshop power tools.

Basically, an arc welder is a tool for making things of metal which is used in much the same way as screws, bolts, nails or glue are used when working with wood. A weld properly made is as strong or stronger than the metal which is welded and, in addition, it can be made watertight or airtight. Although welding machines are used principally for joining metals, the heat of the welding arc often is employed for cutting. Heating small metal parts for bending, forging and heat treating is another use for the versatile welder.

Welding machines are of two general types—those that supply an alternating welding current, which are commonly called a.c., and those that supply direct welding current, called d.c. Most a.c. machines have transformers designed and built for a specific current input. For example, the machine shown in Fig. 6 A will supply a maximum of 60-amp. welding current when connected to a 110-volt power line protected with a 30-amp. fuse. This low current input makes a welder of this size an ideal machine for the home craftsman when repairing such equipment as the lawn mower, shown in Fig. 4, or when building new things of sheet metal, pipe and light structural iron. The garage mechanic or sheet-metal worker will find a welder of this size very useful for repairing



Small 60-amp. welder is ideal for home craftsmen when repairing or making things of metal around the house

damaged car bodies and fenders made of material as thin as 20 gauge. The machine, shown in Fig. 6 B, is also an a.c. transformer type having a rated output of 180-amp. welding current. Since it draws only a maximum of 37.5 amp. from the power line, this welder can be used on most 230-volt rural power lines having a power-line transformer of 3 kva or larger. A welder of this size is sufficiently large to handle all types of farm welding, Fig. 2, automobile and truck repair work, Fig. 1, and light manufacturing.

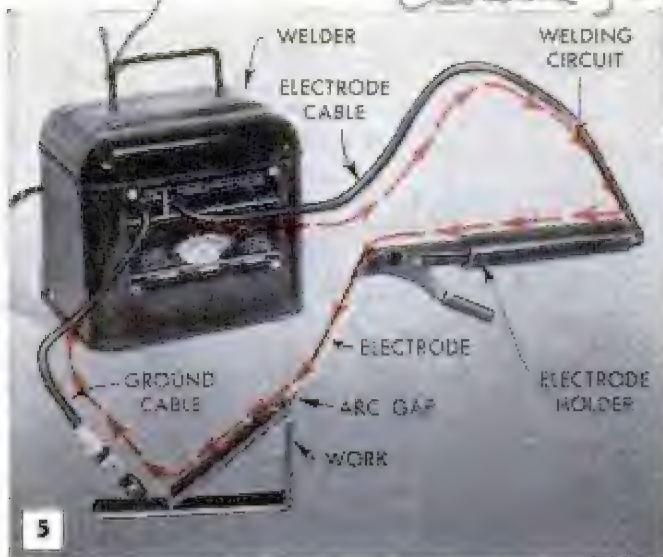
A d.c. welder consists of an electric generator, which produces d.c. for arc-welding. It is driven either by an electric motor or a gasoline engine as shown in Fig. 6 C. Although higher in initial cost, the engine-driven d.c. welder has a distinct advantage over an a.c. transformer-type welder in that the d.c. generator is not dependent upon an outside source of electrical energy to produce the welding current. This makes it self-contained and, therefore, portable. When mounted on wheels, Fig. 3, the engine-driven d.c. welder can be towed to the location of the job to be welded. Thus, it is especially useful for farmers and job-shop operators for repairs on large-size machines which



180-amp. welder is sufficiently large to handle all farm welding jobs from the building of a baled-hay loader, above, to making small repairs on a hand rake, below



12010 Cat Rd.
Chardon, O.



Red arrows indicate path of current, or welding circuit. If welder is a.c. type, direction of current alternates or reverses each time current flow makes complete cycle

cannot be moved, or for doing emergency repair work on farm equipment out in the field, as shown in Fig. 11.

Regardless of the type of arc-welding machine used, the metal being welded must become a part of an electric circuit. To do this, the ends of two insulated flexible cables are connected to terminals on the welding machine or, if the machine is the type shown in Fig. 5, the cables are connected with jack and plug fittings on a control panel. The other end of one of these cables is connected to the work to be welded and this is known as the ground cable: The other end of the second cable, known as the electrode cable, is connected to an electrode holder, which is held in the operator's hand. An electrode, or welding rod, which is a metallic rod incased in a flux coating, is clamped in the electrode holder. When

6 TYPES OF WELDERS



A 60-AMP. A.C. TRANSFORMER-TYPE WELDER



B 180-AMP. A.C. TRANSFORMER-TYPE WELDER



C 180-AMP. D.C. ENGINE-DRIVEN WELDER

7 PROTECTIVE CLOTHING

SHIRT-COLLAR
BUTTONED

SKULL CAP

WORK SHIRT,
LONG
SLEEVES
BUTTONED
AT CUFF



OVERALLS
OR WORK
PANTS

NO
CUFFS

WORK SHOES (NOT OXFORDS)

8 TOOLS AND ACCESSORIES



HELMET



GLOVES



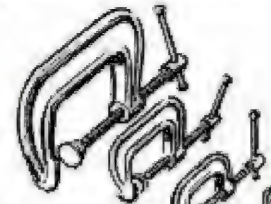
CHIPPING
HAMMER



ELECTRODES



WIRE
BRUSH



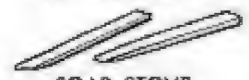
C-CLAMPS



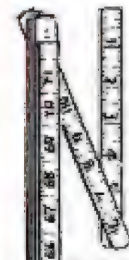
PLIERS



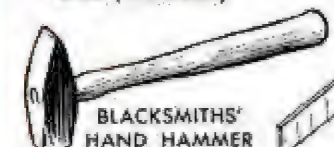
COLD CHISEL



SOAP STONE



6-FT FOLDING
RULE (WOODEN)



BLACKSMITHS'
HAND HAMMER

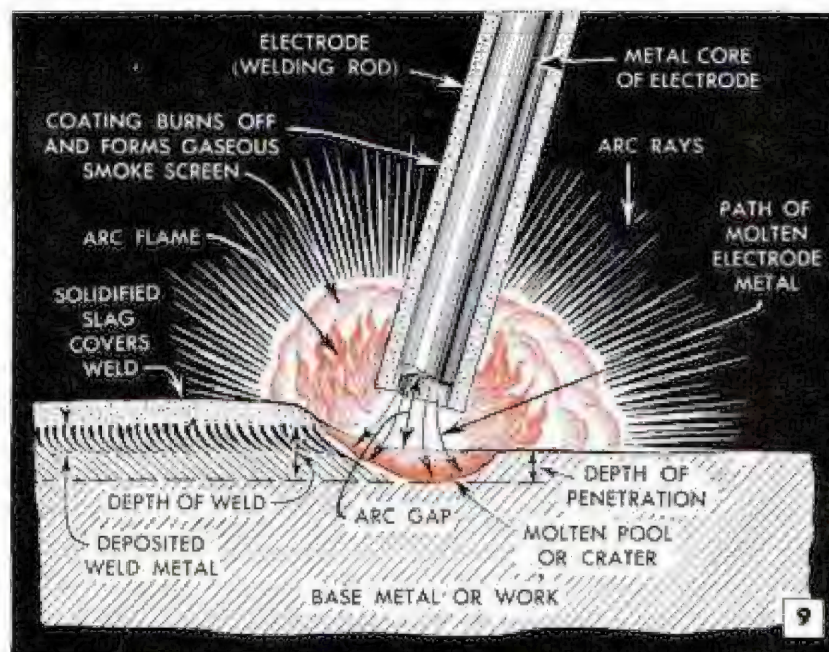
2-FT. SQUARE

welding, the electric current flows from the machine to the electrode holder and through the welding rod. As the tip of the rod is brought momentarily in contact with the work and then immediately raised to form a small gap between the work and the rod tip, the current jumps the small gap and the welding arc is created. The current is then carried through the metal of the work and back to the welding machine through the ground cable as shown in Fig. 5. This is called the welding circuit.

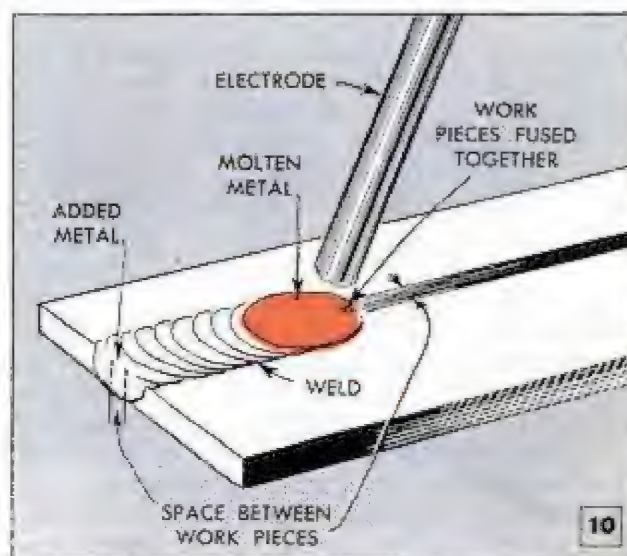
As the heat of the welding arc is very intense and highly concentrated, it is ideally suited for its purpose because the arc can be directed and confined to only that area of the metal being welded.

Fundamentally, arc welding is accomplished by heating the adjoining edges of the workpieces to the melting point and then adding enough molten metal from the electrode to reinforce and fill up any gap or space between the parts being welded, Fig. 10. To learn how to arc-weld, an understanding of what happens within the arc, Fig. 9, is necessary. The moment an arc is struck between the tip of the electrode and the base metal or work, a small pool of molten metal is formed directly beneath the electrode tip. This pool is called the crater, the depth of which is the distance the weld extends into the work and is known as the penetration of the weld. Simultaneously with the formation of the crater, the tip of the electrode is melted and forced across the arc into the crater where it combines with the base metal to form the weld. As the welding rod melts, a portion of the flux coating burns off, forming a gaseous smoke screen which envelops the arc, thereby protecting the molten metal from contamination by the oxygen and nitrogen present in the surrounding atmosphere. The remaining portion of the flux coating melts and is carried to the crater where it combines with any impurities in the molten metal. This action results in a slag which floats to the surface of the molten weld metal and solidifies as the weld cools. The slag coating thus formed covers the deposited weld metal and further protects it from the atmosphere as it cools.

Many different chemicals are used in compounding the flux coatings. Some coatings contain as few as five different chemicals, while others contain as many as



thirty-five. The type of flux coating largely determines the operating characteristics of the electrode; for example, its stability, position of the rod in relation to the work, penetration of the weld metal into the work and the shape of the finished weld making it either concave or convex. Another important operating characteristic determined by the rod coating is polarity. When the electrode cable is connected to the negative terminal on a d.c. welder, the polarity is known as "electrode negative." If the electrode cable is connected to the positive terminal, the polarity is said to be "electrode positive." Some electrodes will operate only on one specified polarity, while others will operate on either polarity. Electrodes used with a.c. welding machines must be the type that will operate with either polarity since a.c. alternates from negative to positive each time the flow of current makes a complete cycle. Therefore, a.c. electrodes can be used with d.c. welders on either polarity. However, d.c. electrodes





Gasoline-engine-driven d.c. welder mounted on auto front-axle assembly can be towed to location of the job

12. MATERIALS USED TO MANUFACTURE FARM EQUIPMENT	TYPE OF STEEL			
	Low Carbon	Mod. Carbon	High Carbon	Cast Iron
SHEET METALS (FENDERS ETC.)	X			
ANGLE IRON	X			
PIPE (PLUMBING)	X			X
MACHINERY FRAMES (AGR'L)		X		
HARROW DISCS			X	
HAYRAKE TEETH			X	
FORGINGS	X	X		
PLOW SHARES			X	X
FILES AND CHISELS			X	
ROUGH GEARS AND SPROCKETS		X		X
MOWER WHEELS				X
ENGINE BLOCKS AND HEADS				X
FURNACE GRATES AND BOWLS				X
I-BEAMS AND CHANNELS		X		
SPLINESHAFTS AND AXLES		X		
SPRINGS			X	
BUMPERS			X	
SHOVELS		X		
BOLTS	X			
RIVETS	X			
MACHINED GEARS (HARDENED)		X		

designed for one specific polarity cannot be used with a.c. welders. When purchasing electrodes, be sure to specify the type of welder and polarity with which the electrodes are to be used. Specify also the type of material to be welded, because the rod or core metal of the electrode should be of approximately the same chemical analysis as the metal being welded. Thus, a different kind of electrode is used for cast iron than for ordinary steel. The amount of carbon in the steel must also be considered. The table, Fig. 12, shows the carbon content of various metal parts. For bronze, stainless steel or aluminum a still different type of electrode is used. The size of the electrode, or diameter of the core wire, is also impor-

tant. Many sizes are available ranging from $\frac{1}{16}$ -in.-dia. to $\frac{3}{8}$ -in.-dia. core wires. The smaller diameter rods cannot carry as much current as the larger rods and are used for welding thin material where less amperage is needed to melt the metal.

In addition to the welding machine and electrodes, a few other accessories are needed. A helmet or face shield, Fig. 8, should always be used when arc welding. Do not attempt to arc-weld with goggles alone. Helmets are made of lightweight, heat-resisting black fiber, and have a fitting to hold an especially colored glass which permits the user to view the arc safely during the welding process. The helmet also has an adjustable headband with a tilting device to allow the face shield to be swung up clear of the face when the actual welding process is stopped momentarily to place a new electrode in the holder. It is advisable to wear a skull cap beneath the helmet. Ordinary work clothing, when worn as shown in Fig. 7, is best for welding, and

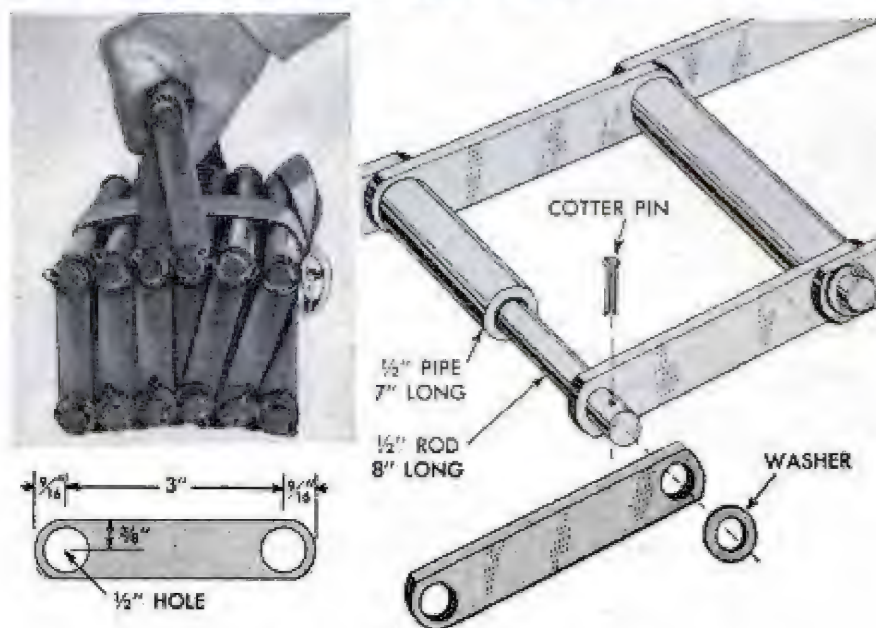
gauntlet-type gloves, Fig. 8, should be worn. For light welding, combination canvas and leather gloves will do. A welder's chipping hammer to remove the slag coating from the welds and a wire brush to clean the welds and material to be welded will be needed. A number of C-clamps of various sizes to hold the work before welding and a pair of pliers or tongs to handle hot pieces of metal after welding are also needed. For measuring, marking and assembling metal parts, a 6-ft. folding rule, some sticks of soapstone and a 2-ft. carpenter's square will come in handy. Other tools in Fig. 8 will also be found useful.

Photos Courtesy The Lincoln Electric Co.

(To be continued)

If you sometimes have to drive your car off the beaten path and over muddy or sandy terrain, you will find that a pair of these unique sand tracks will save many hours of toil should you become bogged down in loose soil. Although the sand track shown was made 36 in. long, it can be any reasonable length. Note that the track folds into a compact bundle for carrying and storage. The track is simply a number of short lengths of rod and pipe linked together with pieces of flat iron. The rod is cut into 8-in. lengths and a transverse hole for a cotter pin is drilled $\frac{1}{8}$ in. from each end. A 7-in. length of $\frac{1}{2}$ -in. pipe is slipped over each rod. The flat-iron links of $\frac{1}{8}$ -in. stock are cut to the dimensions given in the lower left-hand detail, $\frac{1}{2}$ -in. holes being drilled at each end so they will fit over the rod. With the pipe serving as a spacer between the links, the latter are slipped over the rod ends, as shown, and are locked in place with washers and cotter pins. In use, the pipe sections rotate around the rods. This is particularly helpful when pulling out of deep holes, as it allows just enough movement to prevent stalling the engine when

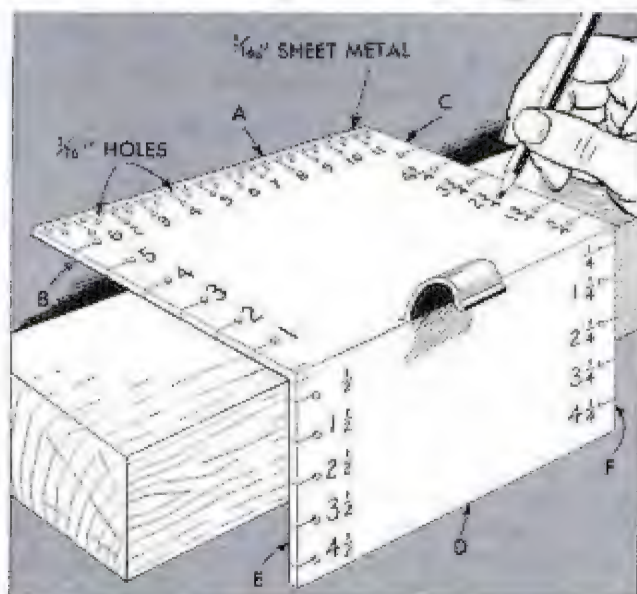
Roller Sand Tracks for Off-Highway Driving Rescue Car Mired in Muddy or Soft Ground



the clutch is released. If you wish to use one section of the track as a carrying handle, install an odd number of crosspieces so the section will fold outward neatly.

Walter B. Ford, Los Angeles, Calif.

Graduated Carpenter's Gauge of Sheet Metal Speeds Laying Out Mortises



This sheet-metal carpenter's gauge is especially handy to speed layout work when marking mortises. The gauge is a piece of sheet metal bent at right angles, one side being somewhat longer than the other. The metal is cut straight so that any edge will serve as a try square and the edges are graduated in inches and fractions of an inch. At the end of each mark, a $\frac{1}{16}$ -in. hole is drilled to receive the point of a pencil. Edge A, which should be as long as the widest board likely to be worked, is graduated in $\frac{1}{4}$ -in. units. Edge B is marked off in inches. C is graduated in inches beginning with $\frac{3}{4}$ in., E in inches beginning with $\frac{1}{2}$ in. and F is also in inches starting with $\frac{1}{4}$ in. Edge D is left blank or graduated in metric units if desired.

Wm. P. Houser, Organ, N. Mex.

Water System for Brooder House Has Barrel Reservoir



One poultryman installed a gravity-fed water system in his brooder house, utilizing a large barrel as a reservoir. An outlet at the bottom of the barrel is equipped with a T-fitting. Two hoses connected to the fitting carry the water to a run of pipe along each side of the house from which the water is distributed to individual drinking fountains in the pens. The barrel is filled with water by hand, using a length of hose attached to the well pump.

Individual Spark-Plug Cleaner Chips Away Carbon Deposits

When shaken violently, the needles in this spark-plug cleaner chip away the carbon deposits on and around the terminals. Not only is it excellent for cleaning car spark plugs, but it is especially handy for

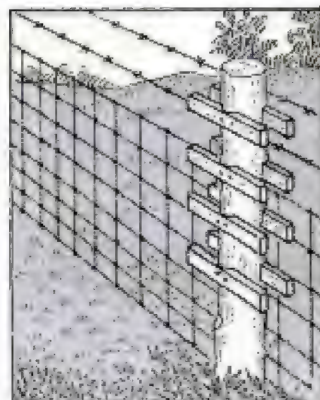


cleaning outboard-motor plugs which often become fouled at low trolling speeds. The container is a 5-in. length of steel rod which is bored to about $\frac{1}{8}$ in. from the bottom. The open end is tapped to receive the spark-plug threads. Eight or ten heavy needles are dropped into the container, pointed-end-up, and the spark plug is turned into the threaded end.

Cleats Nailed to Fence Posts Provide Convenient Stiles

You can climb over a farm fence at a number of places if several of these simple stiles are nailed to the posts at intervals along the fence. The stiles are made by nailing wooden cleats to the posts on opposite sides of the fence to form miniature ladders. The posts must be notched for the cleats to prevent the nails from being pulled loose.

Charles E. Mason, California, Mo.



Weed Killer Applied With Brush

If fear of injuring valuable plants keeps you from spraying near-by weeds with 2,4-D, you can apply the solution to the weeds with a paintbrush. By painting a half dozen leaves of a poison-ivy vine, for instance, enough of the 2,4-D will be absorbed



to kill the entire vine. When spreading the weed killer, be careful not to get any of it on the leaves of plants or bushes. Clean the brush afterwards and soak it for 24 hours in a weak ammonia solution to remove all traces of the 2,4-D. If a brush is not handy, a wad of cotton on the end of a stick will serve as an applicator.

Spare Tape Kept Under Car Hood

To make sure he has some friction tape available when needed, one motorist keeps a few feet of tape wrapped around a radiator hose or brace rod under the car hood.

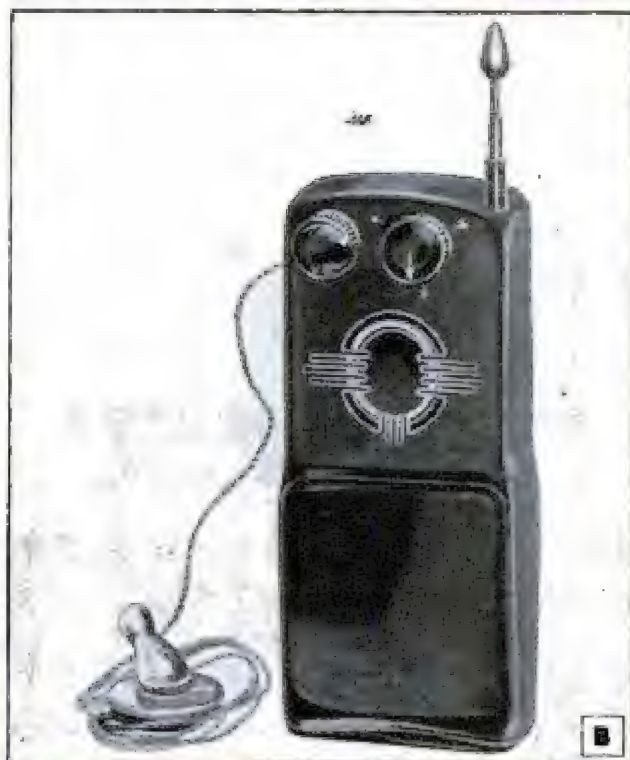
Gordon Wilson, Myrtle Sta., Ont., Can.

Radio Television Electronics

SUB-MINIATURE-TUBE RECEIVERS

PRACTICAL self-contained battery-operated pocket receivers employing the sub-miniature war-developed tubes are now appearing on the market for about \$20.00. They will be in demand at sports events, on fishing trips or any place out of doors. Business and professional people will find them useful, the mailman on his route and the farmer in the field will be able to listen to their favorite broadcast programs and, because of their personal and private nature, they may be used in hospitals or sickrooms without disturbing others. The tiny "Privat-Ear" portable illustrated in photos A and B weighs less than 6 ounces; it is $2\frac{1}{4}$ in. wide, $5\frac{3}{4}$ in. long and $\frac{7}{8}$ in. thick. It is equipped with a volume control and station selector. The antenna is a telescoping type, and reception is obtained through a small earphone which the user inserts in his ear.

Housed in an attractive plastic case, the "Micro Pocket Radio" shown in photos C and D employs three of the sub-miniature tubes and weighs only $5\frac{1}{4}$ ounces complete with self-contained batteries, antenna and listening device. The cost of operation is claimed to be very low.



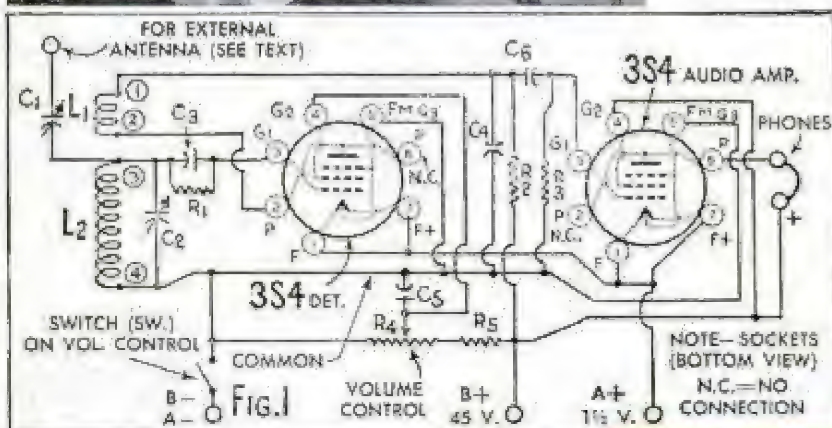
TWO-TUBE "MINI-PAL" PORTABLE

By S. A. Johnson



ALTHOUGH only two tubes are used in this small broadcast receiver, and despite its simplicity, it has a host of interesting features. It is attractive in appearance, thanks to the fact that it is built into a colorful plastic filing-card case. The case is available from dime stores throughout the country for 50 cents. It is 5¼ in. long, 3¼ in. wide and 3¾ in. high with the lid closed. A standard portable-type 45-volt B-battery, and an ordinary 1½-volt flashlight cell for the A-battery, fit snugly in the bottom of the case.

Tested initially in Denver, Colo., the original model received all five of the local stations at night even when



- RESISTORS**
 R1=1 megohm, ½-watt carbon
 R2=100,000 ohms, ½-watt carbon
 R3=270,000 ohms, ½-watt carbon
 R4=0-100,000-ohm volume control, audio taper, with S.P.S.T. switch
 R5=100,000 ohms, ½-watt

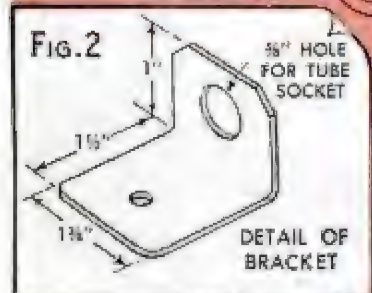
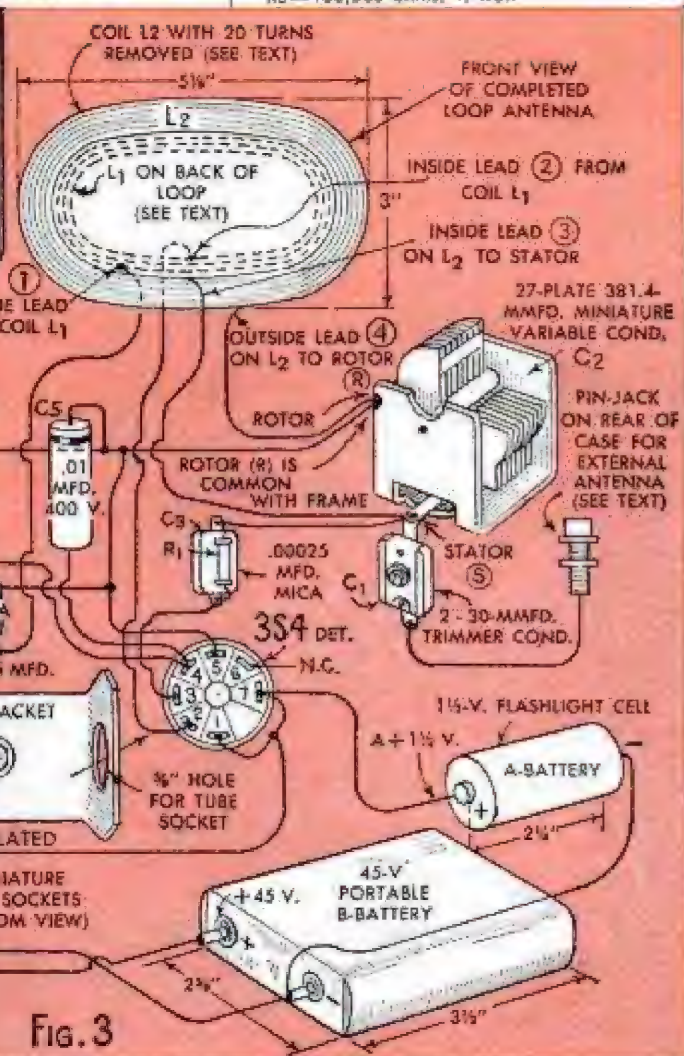
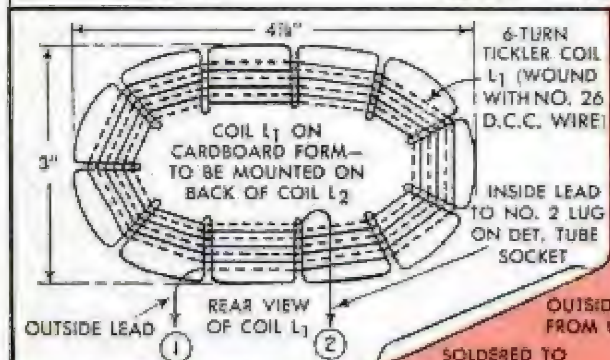
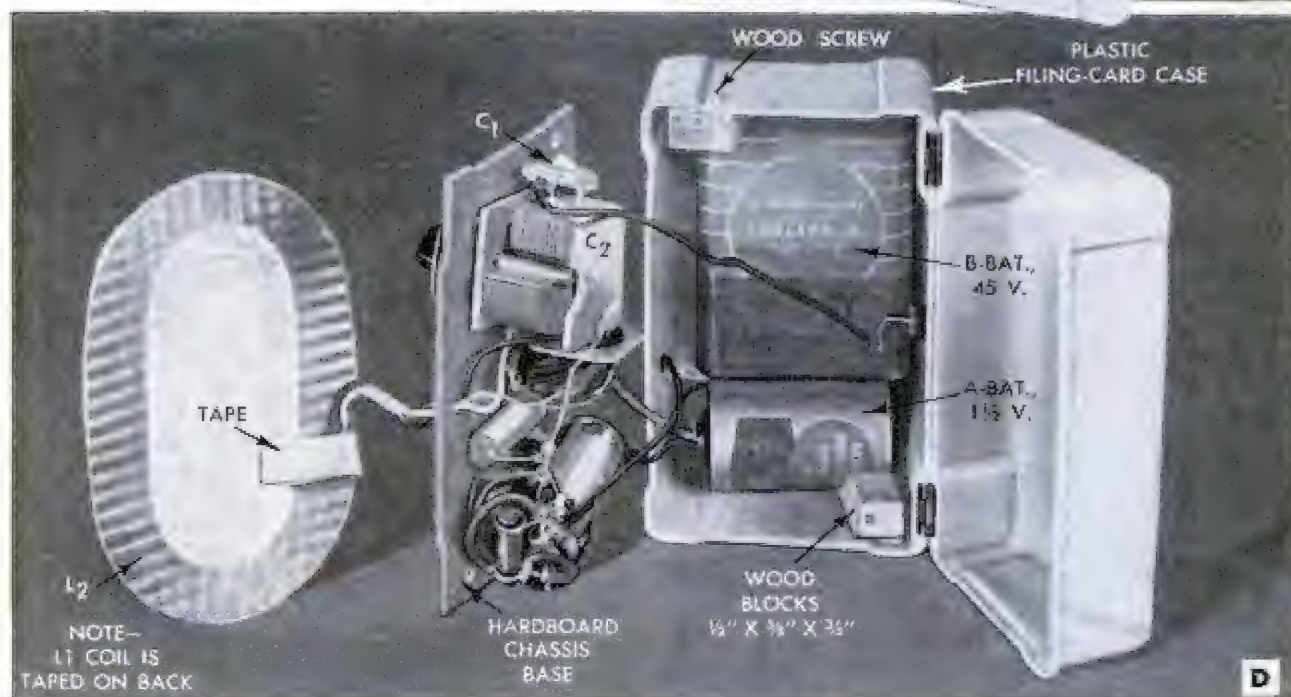
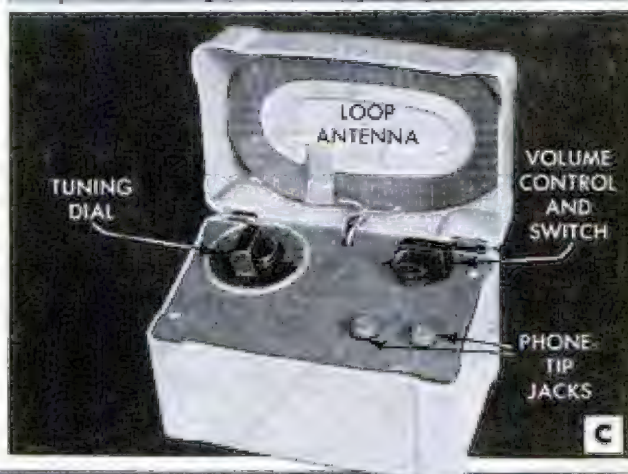


Fig. 3

HAS BUILT-IN LOOP ANTENNA

operated in a deep basement. Upstairs in the house it would bring in quite a number of out-of-town stations with only the built-in loop antenna. When an outside antenna wire was connected to the antenna post on the rear of the case, and condenser C1 was adjusted, stations over a thousand miles away were tuned in. All of the component parts are mounted on the underside of the $\frac{1}{8}$ -in. Masonite hardboard chassis base which is cut to fit neatly into the top of the case where it is screwed to two wooden mounting blocks. The compact loop antenna is an Allied No. 51-035 miniature replacement type with 20 turns removed from the center of the coil in order to make it tune properly with the miniature variable condenser specified. Any similar miniature loop that will tune the broadcast band with a miniature variable condenser may be used. It is only necessary to experiment by taking off turns from the center of the coil, which is indicated as L2, until it will cover the band correctly. As the loop fits inside the lid of the case, it must be about the dimensions given in Fig. 3. Coil L1 is wound on a separate cardboard form and is fastened to the back of L2 with cellulose tape. Coil L1 is a 6-turn "tickler" which provides the regeneration that is responsible for the sensitivity of the set. As will be noted in Photo A, the completed loop in the lid is concealed with a piece of cardboard. The T.R.F.-type midget variable tuning condenser C2, and midget volume control R4, are mounted 1 inch from the top of the

(Continued to page 242)



Turntable for TV Receiver

By M. G. Winterton

PROVIDING the convenience of a full undistorted view of the picture from any desired position in the room, this easily constructed turntable will add to the enjoyment of your television entertainment. Small ordinary trunk rollers, rolling on a Masonite hardboard base, give the owner finger-tip control for changing the position of any table-model TV set, thus making it unnecessary to move the furniture in the room.

The turntable rests on a felt pad and will not mar a table top; photos A, B and D show the turntable placed on a large radio console. Complete construction and assembly details are given in Fig. 1. As table-model TV receivers vary in size and shape, the length of the supporting arms of the turntable must be determined by measuring directly from the rubber supporting feet on the underside of your TV set. You will note in diagram Fig. 1 that the end of each arm is notched to fit against the side of the rubber foot. The trunk rollers are mounted two thirds the distance from the center (pivot point) of this measurement, which also determines the diameter of the $\frac{3}{16}$ -in. Masonite hardboard base. Some TV cabinets are not square in design and this must be considered when cutting the joint.

As will be noted in Fig. 1, a brass-tubing shim permits the upper brass plate, which is fastened to the crossarms, to rotate independently from the stationary lower brass plate which is mounted on the baseboard, thus providing a pivot point. This feature

(Continued to page 242)

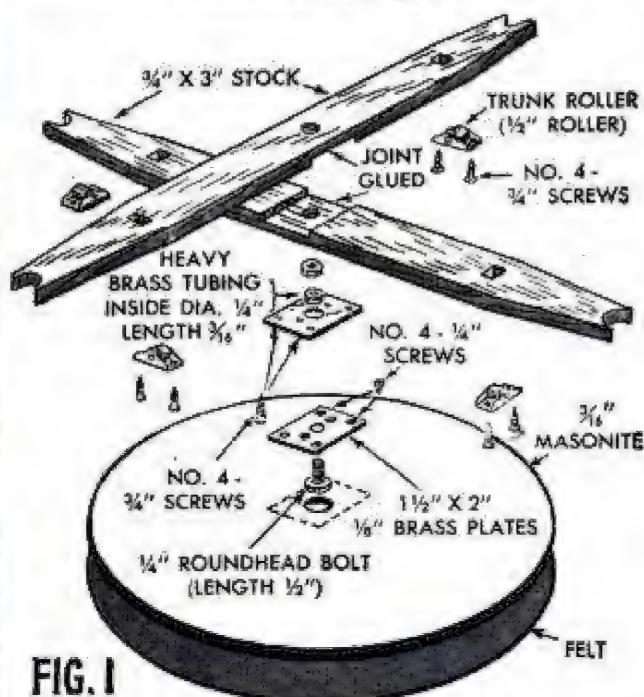
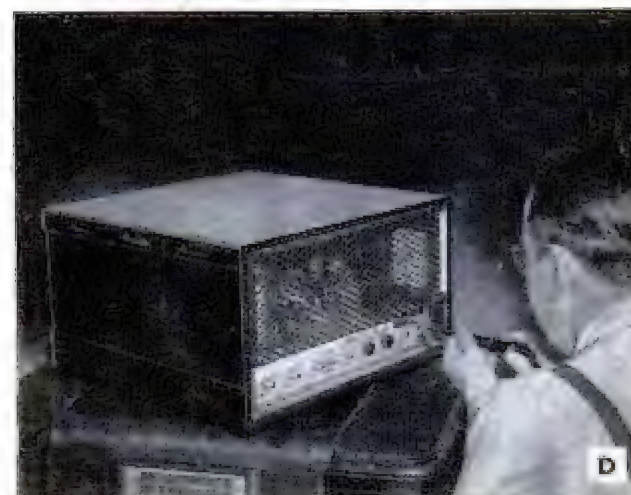
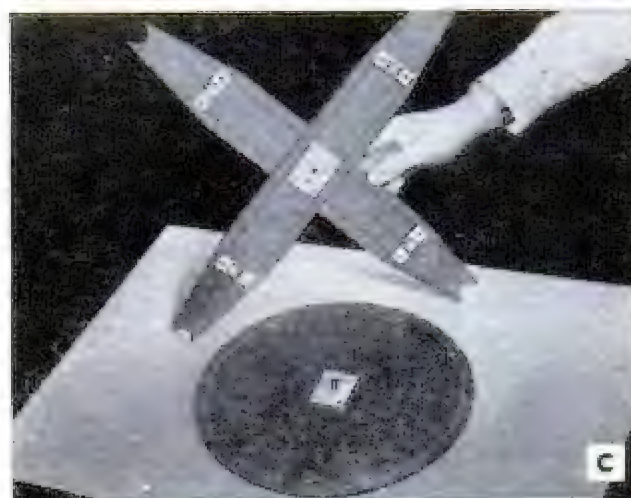
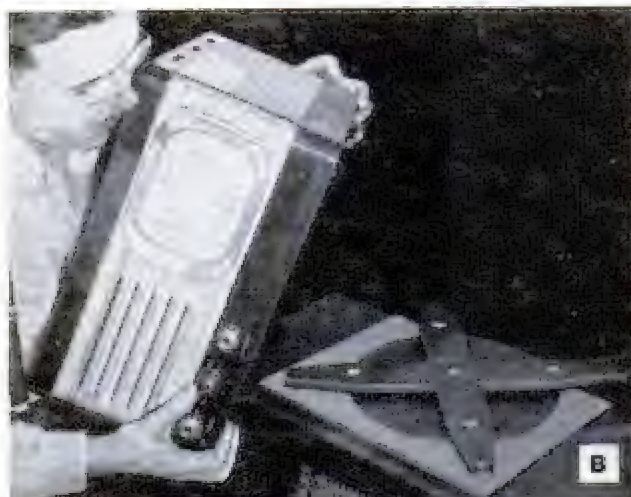
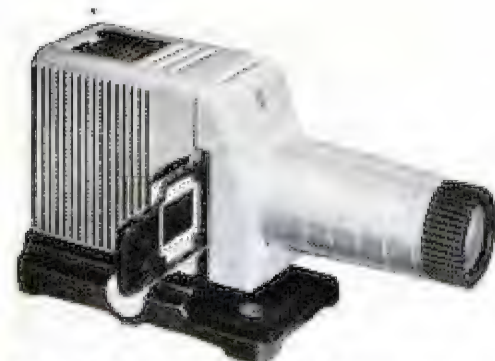


FIG. 1



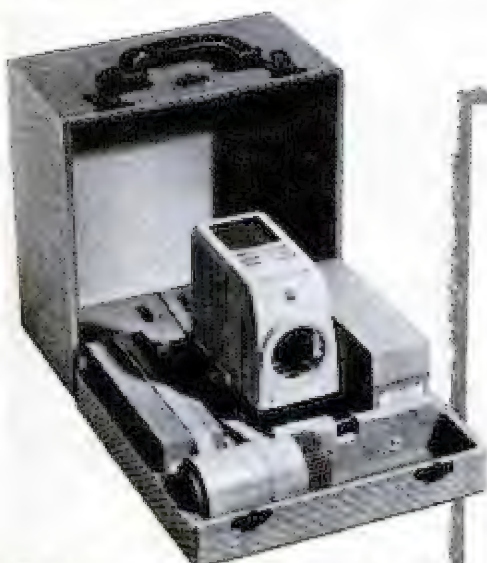
Kodaslide Projector, Model 2A—Luminized Kodak Ektanon 5-inch F/3.5 Lens. Adjustable tilt control. \$47.50.



Kodaslide Projector, Master Model—1000-watt lamp. Superb optical system. \$181 to \$295, depending on lens choice.



Kodaslide Projector, Model 1A—Projects bright images up to 7 feet wide. Efficient, yet inexpensive. \$27.50.



Combination Case (for Model 2A)—Holds Kodaslide Projector, Kodaslide Changer, lens, Kodaslide Sequence Files or Kodaslide File Boxes. \$15.

**IT'S KODAK
FOR BRILLIANT
COLOR SHOWS**
*... everything you need for
miniature-slide projection*



Projecto Case (for Model 1A)—For carrying, storage, and projection. \$10.



Kodaslide Dissolve Control Outfit—For "fade-in-fade-out" effects with Kodaslide Projectors, Models 1, 2, 2A. \$50.



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Turntable for TV Receiver

(Continued from page 240)

is clearly shown in photo C. The trunk rollers are mounted in their slots on washers at the correct height, as indicated in photo E, so that the brass center plates will clear. The turntable is handy when making necessary tuning adjustments on the back control panel as the set can be rotated to face a mirror, thus bringing the screw-driver adjusted controls within easy reach of the operator, as illustrated in photo D.



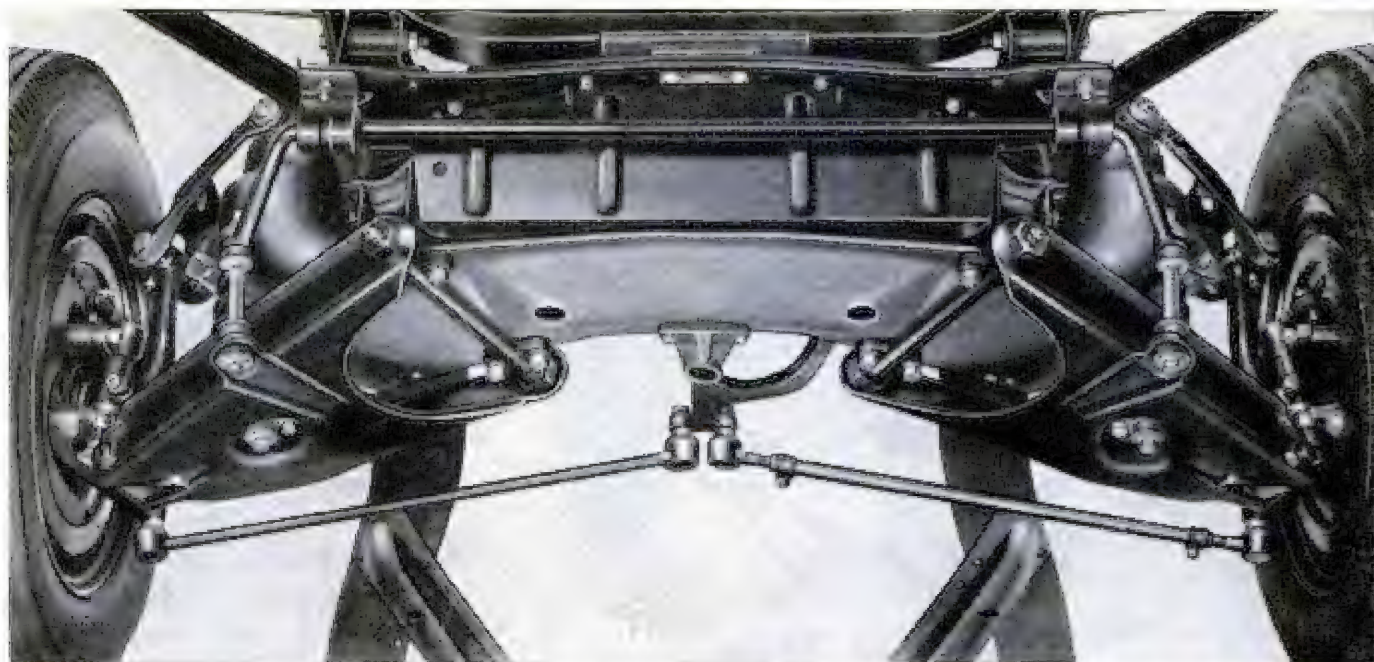
Two-Tube "Mini-Pal" Portable Has Built-In Loop Antenna

(Continued from page 239)

hardboard panel, and 1¼ inches from each side. The exact placement of the parts is not critical; the only unusual thing is the method employed in mounting the tube socket for the amplifier tube. This socket is soldered to a pair of stiff wires which are soldered in turn to the volume control at convenient points. These wires support the socket close to the volume control in the position shown in photo F. The detector tube socket is mounted on the angle bracket detailed in Fig. 2. The miniature type 3S4 tubes were selected for the circuit as this is one of the cheapest of the low-voltage d.c. tubes; it is an excellent detector and also a very good audio-amplifier tube. These tubes have a filament tap, and can be wired for either 1½ or 3 filament volts. The schematic circuit diagram appears in Fig. 1, and the pictorial wiring diagram is shown in Fig. 3. Photos C, D, E and F show various views of the completed assembly.

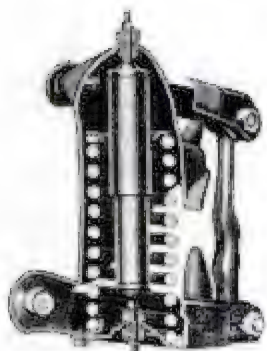
Wiring the set is easy if you are careful, and avoid making mistakes. Be especially careful in wiring the battery leads as an error at this point may burn out the tubes. It is also a good idea to prevent a possible short by completely covering with tape the

(Continued to page 246)

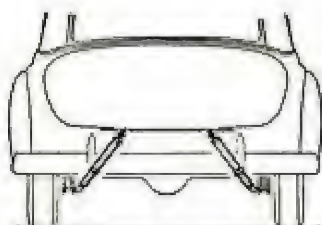


Chevrolet's Unitized Knee-Action, showing new Center-Point steering linkage.

Every car has riding qualities— **CHEVROLET HAS A QUALITY RIDE**

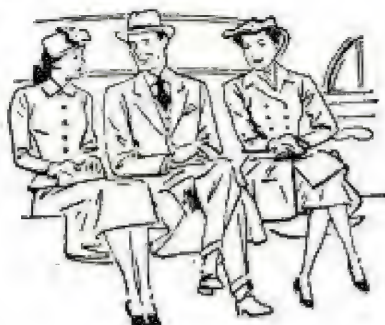


Airplane-type double-acting shock absorbers, mounted inside front coil spring.



Rear shock absorbers, mounted diagonally, both ease the ride and resist sideways.

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The ride's the thing! And with the 1949 Chevrolets, it's the thing that sets them apart from other cars in their field. For the Chevrolet ride—like Chevrolet's chassis and its Body by Fisher—has quality *built into* it. It's a quality ride from the ground up, starting with its extra-low-pressure tires that buoy you over big and little bumps. On top of that you have the new Center-Point design—including Center-Point seating, Center-Point rear suspension—and a lower center of gravity without loss of road clearance. You have all that—plus Chevrolet's Unitized Knee Action, long famous for its superior riding qualities, now improved to make the ride even better. Yes, the ride's the thing! Try it now—and see, also, the many other extra values that make Chevrolet "the most beautiful buy of all." Visit your Chevrolet dealer, now.



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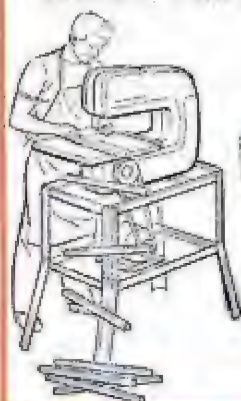
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the exceptional strength,
accuracy, and outstanding
durability of this great
new **CRAFTSMAN** Band Saw!

*Blade is super-strong . . . cut over 2 miles
of 2-inch yellow pine with no sign of
blade failure. Machine is sturdiest ever
. . . ran continuously and perfectly for
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NEW! CRAFTSMAN REG. U. S. PAT. OFF. **3-Wheel Band Saw**

**Exclusive features . . . sensational
performance . . . make it the finest
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Vastly improved over other models! Precision-built, for hairline accuracy; smoother operation! Ideal for model-makers, woodworking and pattern shops, and cabinet makers. Streamlined! **SAFER!** Completely enclosed, except for actual cutting edge of blade! If blade ever breaks, it can't fly out! The only saw on the market with as low a center of gravity, and a 12-in. throat! Cuts to center of 24-in. circle; makes curved or irregular cuts in wood up to 4 in. thick. Double-row ball bearings mounted integrally with shaft, assuring perfect alignment; minimum vibration. Double-row needle bearings on idler wheels. Proper blade tension is positively determined by direct, built-in reading scale (holds firmly; prevents any tension change during operation). Rubber tires, ground true; die-cast wheels machined to close limits, assuring concentricity. 12x12-in. table, mounted on double trunnions, with 4 points of support instead of 2, for greater rigidity; tilts 0 to 45°. Heavy cast iron frame, scientifically designed for maximum rigidity and fewer parts. 1/4x62-in. blade; 4-in. machine pulley. (1/3-H.P. 1750 R.P.M. split-phase, sleeve bearing motor, for 110-120-volt 60-cycle A.C., 3-in. motor pulley and 1/2x54-in. V-belt sold separately at extra cost.)

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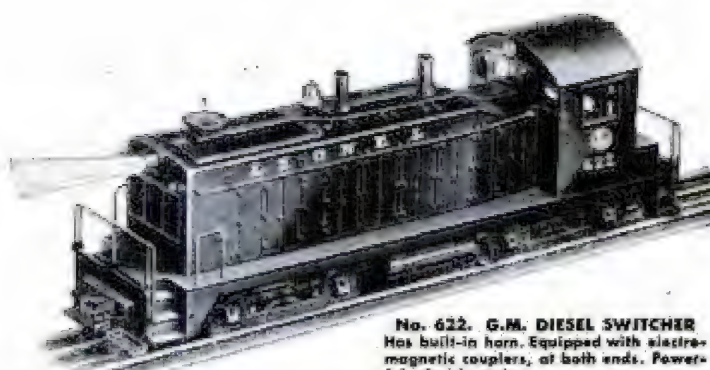
positive 45-volt terminal on the B-battery. With the wiring completed, check and re-check for possible errors before inserting the tubes in their sockets. To test the set, plug in a pair of 2000-ohm headphones and turn the switch on; then advance the volume control to the full "on" position. Next rotate the variable condenser C2. "Whistles" indicate stations; if no whistles are heard, reverse the connections on the tickler coil L1 only. When a station is tuned in, "back off" the volume control until it comes in with good clarity and volume. If,



when you tune in a station at about 550 kc. at the low end of the broadcast band, the variable condenser is not quite fully closed, you may have to take off a few more turns from the inside of coil L2 in order to make the set tune in the high end of the band. Remove the turns one at a time and check until the band is fully covered. Detailed student material list R-382 is available from Popular Mechanics Radio and Electronics department upon receipt of ordinary letter postage.



No. 132. LIONEL TRAIN STATION
Exact copy of rural
wayside stations. Illum-
inated windows. Color-
ful, Realistic.



No. 622. G.M. DIESEL SWITCHER
Has built-in horn. Equipped with electro-
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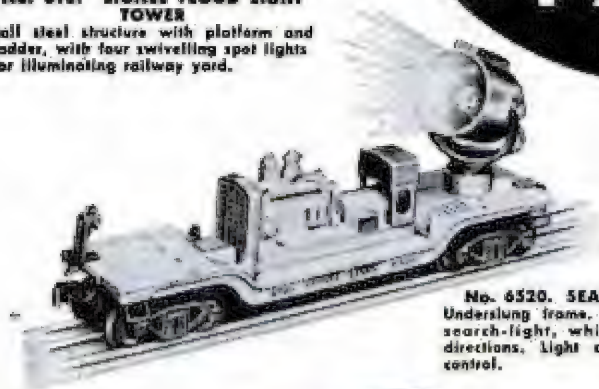


No. 395. LIONEL FLOOD LIGHT TOWER
Tall steel structure with platform and
ladder, with four swivelling spot lights
for illuminating railway yard.

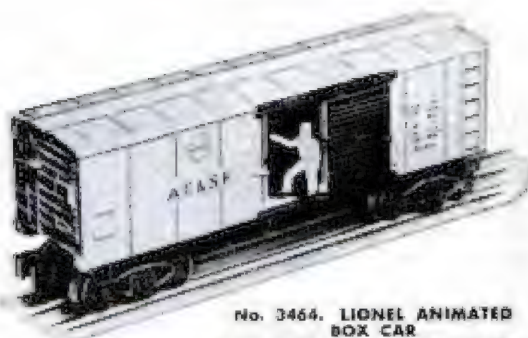


No. 394. LIONEL ROTARY BEACON
A miniature rotary beacon used to
define air lanes, with revolving search
light.

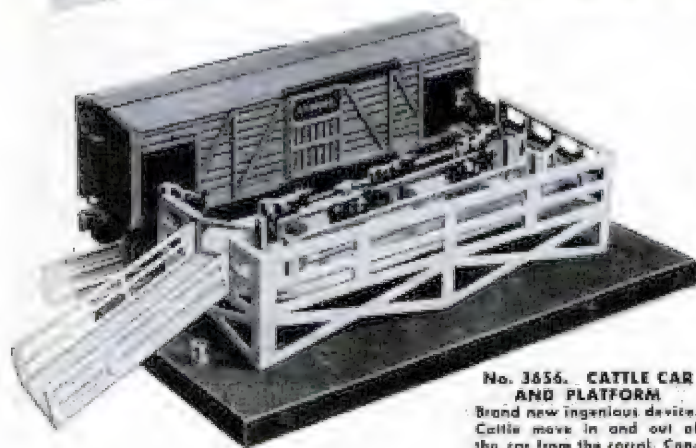
New LIONEL Items for 1949



No. 6520. SEARCH LIGHT CAR
Underslung frame. Mounts a powerful
search-light, which swivels in two
directions. Light operated by remote
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No. 3464. LIONEL ANIMATED BOX CAR
A semi-automatic accessory. A figure
within the car pushes open the sliding
door and appears at the entrance. Con-
trolled by press button.



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Brand new ingenious device.
Cattle move in and out of
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trolled by push button.

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No splashing!
No waste paint!
No dripping!
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to fall out!

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smooth as a professional painter!**

Lays smoothest coat of paint you ever saw! Now you can paint as expertly as a Master Painter! Actually paint twice as fast . . . and with results that any professional painter would be proud of!

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Easy as pressing a button! One coat covers perfectly! Just press gently on the pressure valve tube and r-o-l-l the paint on any surface—smooth or rough, interior or exterior!

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Plywood Applied Over Plaster

Q—I am planning to finish two walls of a room with knotty-pine plywood. The walls are plastered and papered. It has seemed to me that it would be quite simple just to screw the plywood panels directly to the plastered wall, using screws long enough to reach through to the lath. Can I do this, or must furring strips be installed?

L.D., Pittsfield, Mass.

A—You can, of course, install the plywood panels as you suggest but we would not recommend this as an orthodox procedure. On an outside wall especially, there is danger of moisture condensation in the restricted space between the back of the panel and the surface of the wall. However, if the plywood panels are to be applied only to inside walls there is much less danger of moisture collecting behind the panels. In this case, the installation made as you have suggested would probably be satisfactory.

Paint Mildew

Q—I painted my home about a year ago and recently I have noticed dark-brown spots on the siding under the cornices, under a hanging bay window and above a basement window. What is this discoloration, and how can I remove it?

E.B., Portland, Me.



A—Although there could be other causes, of course, it is quite likely that the discolorations, or spots, you describe are caused by paint mildew. This is more commonly seen on the inside of sash frames where moisture condenses on the glass and runs down on the painted frames, keeping the paint constantly wet. However, it does appear in more rare instances on exterior painted surfaces. It is simply a mold growth—often a common food mold—which forms on the paint film. It usually develops during long periods of relatively high humidity or any other condition which subjects the paint to moisture for a considerable length of time. Fortunately, true mildew growths do not damage the paint directly. They are merely unsightly. However, damage to the paint may result from the moisture present and from attempts to remove the growth. If the surface is moist, the mold can be wiped off quite easily with a dry cloth but, if the surface is dry, it will be necessary to use

(Continued to page 250)

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America's Favorite



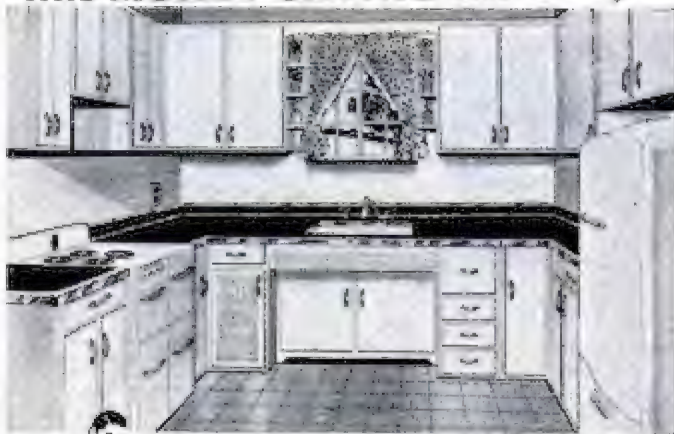
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Enclosed is \$.....for material requested below.

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either a paint cleaner, household ammonia or a mild solution of trisodium phosphate to remove the growth. Where possible, the causes of the mold should be eliminated.

Coated Clothesline

Q—I leave my aluminum clothesline up permanently and, lately, each time before hanging a washing I have to clean the line with a strong household cleaner, as a black coating forms on it which soils the clothes. How can I prevent this coating from forming?

J.S., Philadelphia, Pa.

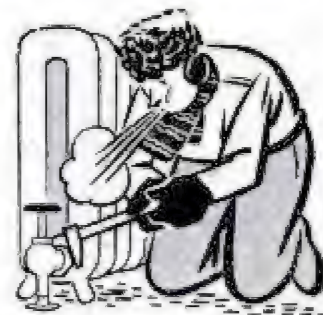


A—The "black" coating you refer to probably is caused by alkali in the cleaning solution. Such solutions should not be used for cleaning aluminum clotheslines. Some users of these lines report good success in the prevention of discoloration by coating the line with ordinary paste wax. Although we have no data on the corrosion-preventive qualities of paste wax when used for this particular purpose, the idea at least seems reasonable. Of course, it is doubtful if the wax coating would withstand weathering for any length of time. It probably would have to be renewed frequently. We do not believe you will have further trouble if you simply clean the line by rubbing lightly with a mild soap solution and thereafter just wipe the line with a soft cloth each time before hanging the clothes.

Faulty Radiator

Q—A year ago we moved into a house which is heated with a conventional steam boiler. One radiator in a first-floor bedroom does not heat. I replaced the air valve and checked the control valve. The latter proved to be in good order. Still no heat. What can be wrong?

R.M., Bay City, Mich.



A—There are several possibilities, but did you check the level of the steam pipe leading to the radiator? Occasionally this pipe is lower at the radiator than at the opposite end of a horizontal run. This condition might have resulted from a faulty installation, settling of the building or some change made in the steam lines after the unit was installed. At any rate, it is a fairly common cause of the trouble you describe. Check the branch steam line with a level. It should incline upward from the main line to the radiator about one half inch or so for each 10 feet of length. If it inclines downward, raise the radiator on blocks or change the pipes to correct the condition.

Thermostat Setting

Q—A year ago I installed an automatic draft control on my hand-fired furnace. Last winter I noticed that the thermostat did not seem to operate properly. For some reason, the thermostat thermometer registered about the same as the dial setting, but a separate thermometer placed nearby registered 7 to 10 deg. higher. Fuel consumption was high until I set the thermostat back to 65 degrees. Then the wall thermometer registered about 72 to 73 deg. What is wrong with this thermostat?

C.T., Topeka, Kans.

A—Probably nothing is wrong with the thermostat mechanically. It is noted from your description that the thermostat thermometer registers very nearly the same temperature as the dial setting calls for, but that the wall thermometer registers 7 to 10 deg. higher. This fact may be the clue to the cause. It is suggested that you carefully remove the thermostat and tightly plug the hole in the plaster through which the wires were led to the thermostat. Cold air coming through this hole can affect the operation of the thermostat.

YOU WON'T GET ANYWHERE UNLESS YOU START



WHEN IT'S AN *Exide* ... YOU START

No one loves a late-comer. Nor do waiting friends care to divide attention between an interesting game and a tale of car-starting trouble. It's no excuse to them . . . shouldn't be for you, because it need not occur.

To arrive on time, be sure your car will start. When you buy a battery for your car, buy *starting assurance*. **REMEMBER**, a single starting failure can be far more costly than the little extra you pay for a trustworthy Exide Battery.



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Exide Batteries of Canada, Limited, Toronto



ONLY \$199.50 FOR A COMPLETE POWER WORKSHOP

Your complete power workshop in just 18" x 60" floor space. With ½-hp. ball-bearing motor illustrated, \$199.50.



FOR less than \$200—and with eight square feet of floor space—you can have a power shop second to none in capacity, accuracy and flexibility. It's SHOPSMTIH—five heavy-duty, extra-feature tools in one unit so beautifully engineered, so ingeniously designed that you can convert from tool to tool *in less than 60 seconds*.

NEVER BEFORE SUCH AMAZING CAPACITY

Imagine a circular saw that cuts to center of 8' plywood panels . . . a lathe that takes work up to 15 inches in diameter . . . a drill press that mortises doors and panels as easily as it drills miniature parts . . . a disc sander that squares, miters and

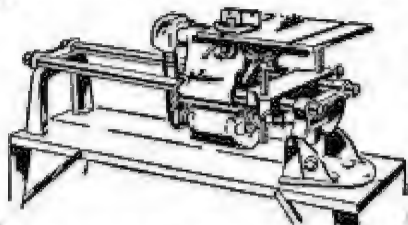
finishes with "try square" accuracy. You get these, and more, with SHOPSMTIH.

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Compare SHOPSMTIH with any combination of single tools at any price. Compare it for accuracy, capacity, all-round utility. You'll see why the thousands of men who own SHOPSMTIH praise it so enthusiastically. On display at any Montgomery Ward store and at leading hardware or department stores. SHOPSMTIH, complete with attachments, costs \$169.50. With heavy-duty ½-hp. ball-bearing motor, \$199.50.

5 RUGGED POWER TOOLS IN 1

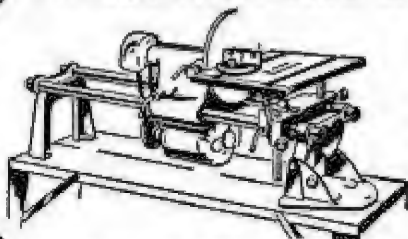
1 EIGHT-INCH CIRCULAR SAW



Effective table width up to 56". Maximum depth of cut, 2 1/4". Machined tilting table, ribbed for extra strength. Precision-tooled rip fence and miter gauge. Unique micro-adjustment permits extremely accurate ripping.



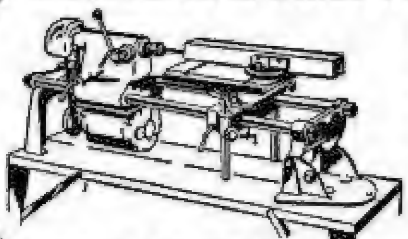
2 TWELVE-INCH DISC SANDER



Cast-aluminum disc easy to attach and remove. Extra-large, adjustable table measures 14 1/2" x 17". Miter gauge and rip fence can be used for accurate squaring and jointing. Has features found in no other disc sander.



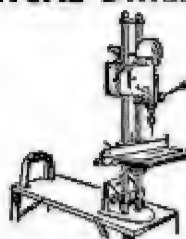
3 HORIZONTAL DRILL PRESS



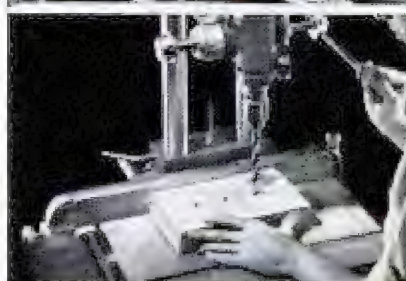
Extremely useful operation possible only with SHOPSMITH. 4" quill feed, automatic stops. Permits large, heavy pieces to be drilled or mortised quickly and accurately. Eliminates need for jigs. Length of work limited only by size of room.



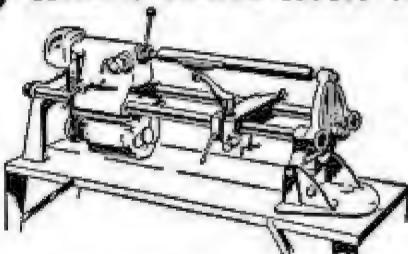
4 VERTICAL DRILL PRESS



SHOPSMITH drills to the center of a 15" circle, has a maximum clearance table to chuck of 27". Jacobs key chuck takes drills from 5/64" to 1/2" diameter. Rugged, six-spline spindle with 4" feed. Variable speeds 875 to 3500 rpm.



5 THIRTY-THREE-INCH WOOD LATHE



With a 15" swing, SHOPSMITH has greater capacity than most other heavy-duty lathes. Distance between centers, 33". Swivel-arm tool rest always slides parallel to ways—no need for constant adjusting. Has 4" quill feed. Quickly adaptable for oversized faceplate work.



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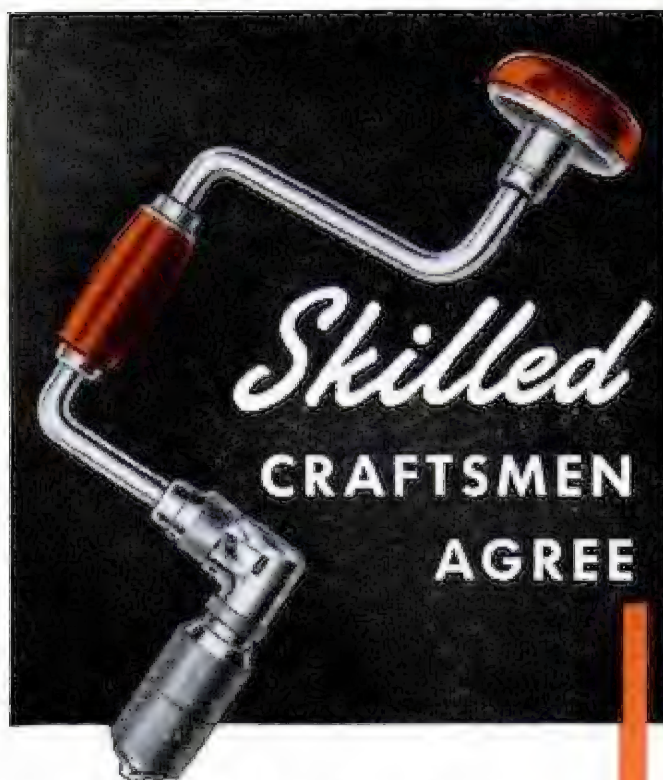
Address SHOPSMITH, Dept. 102-B,
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Color Magic From Black and White

(Continued from page 108)

replace it after a few smears and blots.

Kodak announces in its careful instructions that "smearing" is the best way to paint the print. Any unevenness is smoothed out by the acetic-acid rinse after the first blot. The acid not only "evens out" but "fixes" the dye so it won't be too unstable as the painting goes on.

Borderlines between colors are no problem. They can be melted together or, if the line is sharp, its very sharpness indicates a dark shadow line, and the darker color can be brought right up to the edge of the lighter color with utmost ease. Even the hazy line between hair and forehead is easily blended.

A big brown splotch accidentally dropped on the nose of a pretty lady in a portrait would be disastrous in a regular print-coloring process. If it happens with Flexichrome, the chagrined photographer just smears a little black dye over the affected area and starts over. If the mistake is more serious, he can smear the whole print with the modeling agent and try again. This can be done as often as desired.

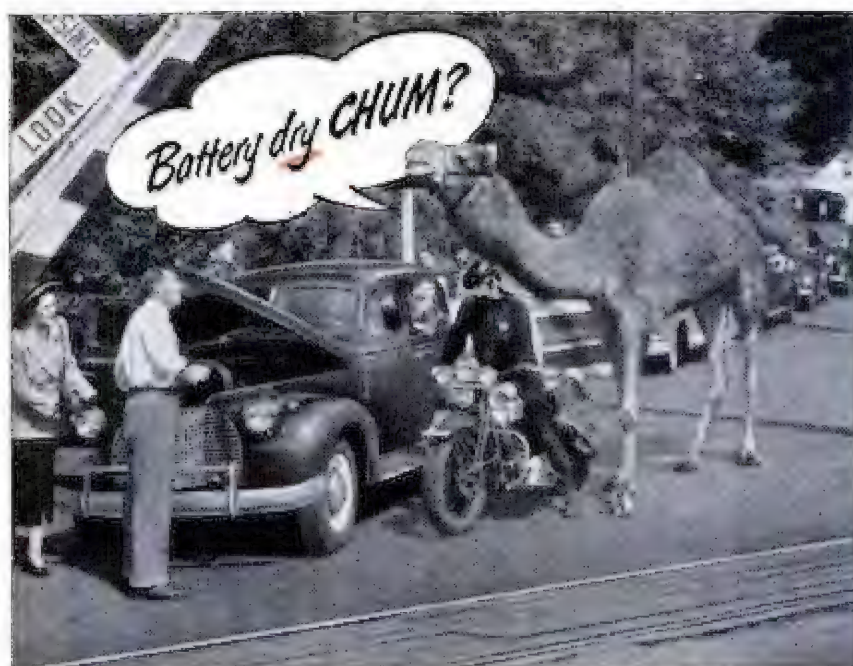
For fussy people, there is also a "reducer," which is the "white" of the Flexichrome process. Though it is absolutely colorless, it acts like other colors in that it replaces whatever color you smear it on, leaving only the clear white paper base showing through the gelatin.

It has a lot of uses. Sparingly applied, it can tone down a too deep shade. It is handy for vignetting, putting in highlights or clouds.

After 17 years, Jack Crawford is watching his brain child roar into mass production. All the necessary ingredients now are available at professional photographic supply stores. But you'll be seeing the results in almost every national magazine on the newsstands.

"It sure does away with a lot of the grief we used to have," Crawford recalls with a faraway look. "I can remember the trouble I had with water. It had to be Simon pure and clear of dirt for process color. My studio plumbing was fitted with filters on top of filters—and still the water stayed dirty. One speck of soot or grease could ruin a whole week's work, too."

But it's the simplicity of his process that pleases Crawford most. "All a photographer needs," he points out, "is an original black-and-white negative—showing good detail in both the shadows and highlights, with lots of middle tones. If he has this, he's all set. Flexichrome will do the rest."



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OCTOBER 1949

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Seal It With Rubber

(Continued from page 177)

layer on the surface, beneath the film, as a result of the presence of excess water. This is lessened by a wrapping that permits some moisture to escape.

There are numerous ways of using films in the home. Did you ever start to make breakfast toast and discover that the bread-box contained only a slice and a crust of half-dried bread? This need never happen if you have one or more loaf-sized bags made of moistureproof film. Slip each loaf of fresh bread into a bag, make two folds to close it, secure the folds with a paper clip or two, and place the package in a refrigerator—and you can open it many days later and take out a loaf virtually as fresh as the day it was baked. If you were to enclose the bread in film and keep it at room temperature, it might mold—refrigeration retards mold growth. This method can be used for preserving other kinds of baked goods, film authorities say.

Many housewives use transparent film to wrap freshly laundered sheets, towels, blankets, seasonal clothing and other articles that are to be stored a while before use. The system is particularly useful in guest rooms. Such wrapping also is an effective way of keeping moths from attacking woolens, but the material to be stored must be free of moth eggs and larvae before wrapping.

The little matter of keeping a paintbrush from drying out between coats, or even for weeks or months of idleness, has been made simpler by the introduction of a Pliofilm envelope equipped with an elastic tie string. The brush is inserted, after excess paint has been drained off, into an envelope and the string used to bind the film tightly around the handle. By keeping out oxygen, the envelope prevents the paint in the bristles from hardening. If desired, a little turpentine can be placed in the bag.

The makers of Pliofilm like to demonstrate a method for sealing bottles, wrapping soap and similarly sealing all kinds of things to retain moisture and to keep dirt out. The process is called stretch wrapping, and anyone can do it with a wrap and three hands, or with only two hands, the match and an embroidery hoop. Pliofilm is a thermoplastic material, which means that it softens when heated. To stretch-wrap the cap end of a bottle, hold a piece of the film taut and horizontal, or place it in an embroidery hoop to maintain tautness. Hold a lighted match or candle so the flame is a few inches below the film, moving it around so an area perhaps three

(Continued to page 258)

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inches in diameter is heated. You can see the film change in appearance as it becomes plastic. Quickly bring the bottle beneath the film, force the cap upward through the heat-softened spot, give the bottle a twist and immediately pull it downward. After a little practice you can make a neat seal every time.

Nonmoistureproof cellulose film can be used to make a skin-tight seal over bottles, jars, jelly glasses, tubing ends and various other openings. Dip the film into water, squeeze or wipe off the excess wetness, place the piece over the opening and fold its edges down or back like a cap and secure them with a rubber band or string. The film shrinks in drying, producing a tight cover.

When sealing bottles, there may be cases when the bottle contents give off fumes or vapors that might damage some film materials, causing the film to fail. Containers sealed with film derived from rubber should not be kept in strong light if it is desired to preserve the seal on the containers for a year or more.

Films resistant to moisture and greases are helping factories and home workshops fight corrosion. A mechanic desiring to protect a threading tap can coat it with oil or grease and wrap it in an oilproof film. If the film is thermoplastic, he can heat-seal the wrapping. Another way of preventing corrosion of a tool or other article is to seal it in an air and moistureproof film container along with a quantity of a moisture-absorbing material such as silica gel.

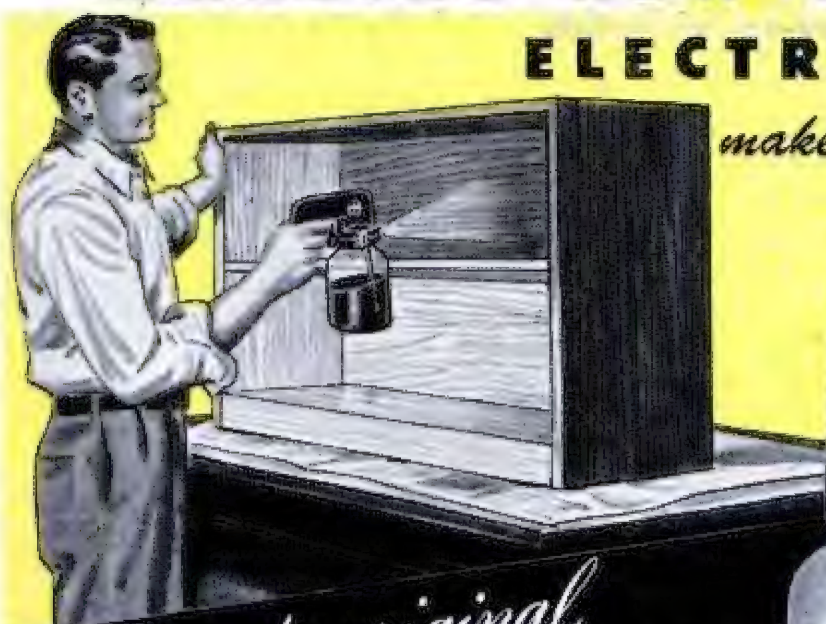
Film-wrapped materials suitable for home and hobby-shop use are usually obtainable from local department stores, hardware, drug or novelty stores. Manufacturers should be consulted for information concerning industrial applications involving specialized uses of film materials. Film to be used in contact with food should be a type suitable for that purpose.

Constant research is producing forms of film wrapping materials that promise even greater wonders. Tensitized Pliofilm, for example, is a special form of extreme thinness. One of its abilities is to let carbon-dioxide gas diffuse through it at about the correct rate required for normal breathing of apples and other living foods wrapped in it. An edible type of film made from pectinates derived from fruits is being studied in connection with food preservation and protection.

Ⓢ Built to haul fresh meat from Australia, a new British ship is really two ships in one, as it has an inner and outer hull which are separated by a layer of granulated cork to keep tropical heat out.

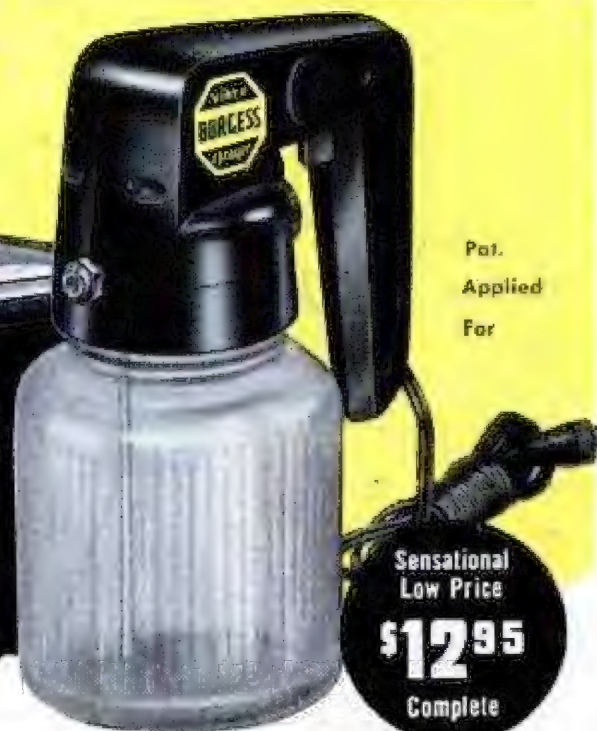
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They Pilot Sky-Piercing Rockets

(Continued from page 119)

Our decisions must be made before the normal burn-out time because after its fuel is cut a rocket behaves like an artillery shell. It continues to fly in a trajectory that was determined by the thrust of its motor. Virtually nothing can be done to affect this trajectory."

Detonating the blocks of TNT behind the warhead simply reduces the impact when the missile lands. Breaking up the rocket does not bring it down short of the target area although the pieces do not land at the exact point that would be hit by the whole missile. Even if the warhead and body were blown into small bits this debris would continue on an almost normal trajectory.



Body of the rocket falls to earth at about 100 m.p.h. Though crushed, it protects the instruments inside

There is a difference, however, in the speed at which the pieces would land.

If Karsch explodes the TNT when the rocket is 50 or 100 miles up, practically nothing happens at the time. The warhead and the airframe are moved apart by a few inches or a few feet but the rocket continues along its trajectory just as if nothing had happened, due to the lack of air resistance. The airframe falls behind when it reaches a low altitude. Spoiled of its streamlined shape, it slows down, tumbles and spins, and lands at about 100 miles per hour somewhat short of the point at which the warhead smashes to earth. The warhead hits at nearly its normal velocity, something under 2500 miles per hour.

Karsch blows off the warhead on most flights as a matter of course, at about 40 miles altitude on the downward plunge. This allows the airframe to land as gently as possible. Test and research instruments

(Continued to page 262)

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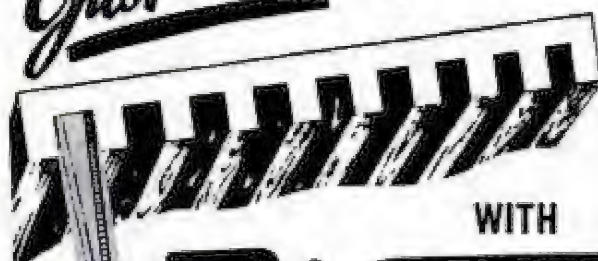
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are carried in the body of the rocket as well as in the warhead, and when the body drifts down relatively slowly, all or most of the instruments it carries are unharmed.

A V-2 or a Bumper rocket or any of the new American high-altitude missiles is a very busy vehicle in flight. Numerous instruments are at work and a multitude of radio circuits are in continuous operation.

Grenades may be fired from a rocket at various altitudes so that observers can note the time that elapses between the sight and the sound of the explosions. Aircraft components may be carried aloft for testing their aerodynamic behavior at tremendous altitudes. Parachutes are discharged from the rockets, high in the sky, to learn the speeds with which the parachutes open and the accelerations that are imposed on them.

Samples of the upper atmosphere are taken, photographs of the earth are made, cosmic radiation is recorded, the solar spectrum is observed and many kindred experiments are performed, all by automatic equipment contained in the rocket. In some cases, the results are recorded on photographic negatives that are then moved through light-trapped openings into sturdy steel drums. After the drums are recovered intact, when the rocket lands, they are opened in a darkroom.

Now under development by Dr. Severin Raynor and his team of scientists and engineers at Armour Research Foundation is a "cannon ball" which will be shot from the V-2 to measure the heat radiated from the sun, the earth and from space. Such measurements can't be made by the rocket itself because it spins and twists after the fuel is exhausted.

About 60 miles in the air a door in the rocket will open and the cannon ball will be ejected. It is a sphere stabilized during flight by three gyroscopes. Located around the skin of the sphere are 14 thermocouples which measure heat radiation that falls on them. When the cannon ball is ejected, it continues in a trajectory almost identical with that of the rocket, but the gyroscopes prevent it from spinning in the air. Thus the particular thermocouple facing the sun will continue to face the sun throughout the flight.

Measurements are recorded on 16-mm. film by a camera inside the sphere. During the fall the camera itself is blown out of the sphere and eased to the ground by a ribbon parachute.

The information about the upper air which will be provided by the sphere will be "the kind of things a man on a trip to the moon would need to know," according

(Continued to page 264)



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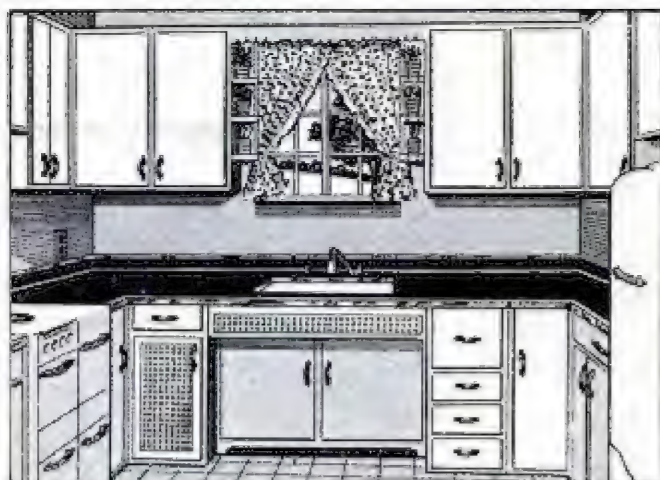
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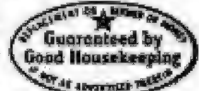
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to Doctor Raynor. He points out that rocket scientists need more information about the climate encountered by rockets in the upper air.

Other information, particularly concerning the behavior of the missile itself, may be reported back to earth by telemeter radio circuits. A few years ago only a few simultaneous telemeter circuits could be employed at one time; now 40 or more channels may be used at once because of improved techniques.

One of the most advanced telemetering installations, developed by the applied physics laboratory of Johns Hopkins University, is contained in a mobile tractor and trailer, air conditioned, that may be driven to the site from which a rocket is to be flown.

The station can receive telemetered information from an airborne vehicle over as many as 50 channels at one time. It is a dual recording station because more than one carrier wave may be used on a single channel. It records much of the information by a high-speed camera that is focused on an oscillograph and that consumes five feet of 35-mm. film per second. Additional channels are fed to strips of photographic paper. Disk recorders are used to make duplicate, audible records.

An amazing amount of information can be recorded during the few minutes or portion of an hour that a missile is in the air. In the past it has required months of tedious work to translate all the data from one flight alone into understandable graphs and figures. This is too slow from the research standpoint, so engineers of Douglas Aircraft Company early this year developed a special mechanical brain, now in use, that digests the entire mass of data and presents it in usable form in less than half a day.

All this work is contributing to the program of developing larger, multi-stage rockets that can be guided to distant points and that sometime may be able to leave the earth and ride off into space.

Injections for Leaky Dams

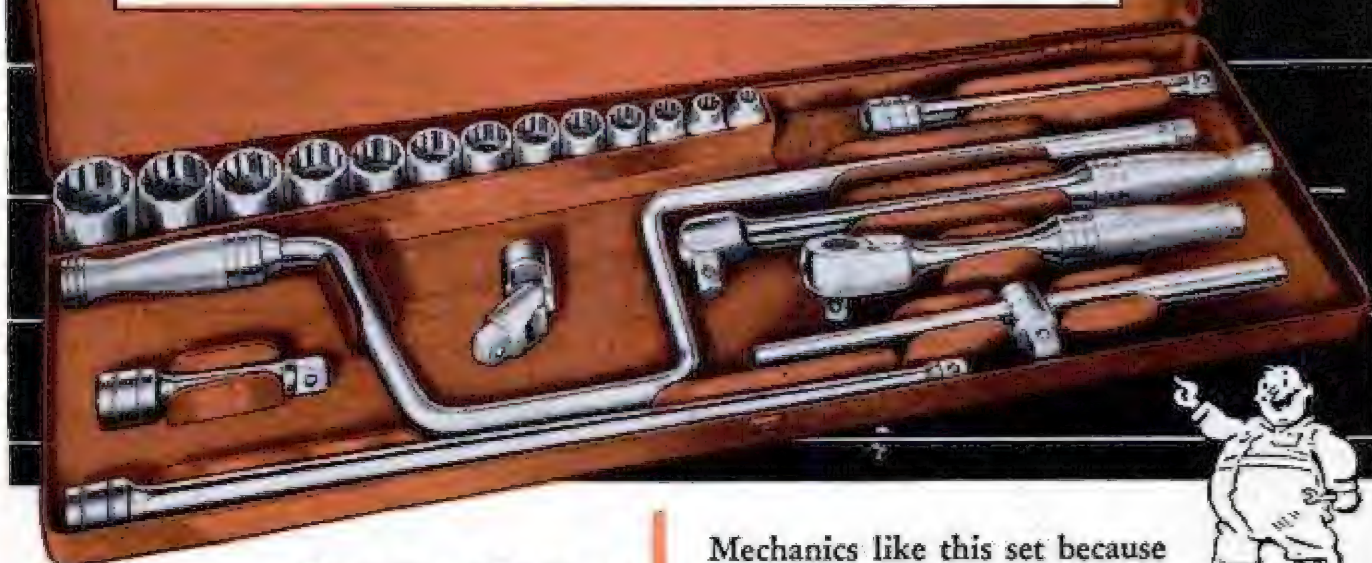
Leaky earth dams are made watertight by an asphalt emulsion injected into the ground. Metal pipes first are driven into the earth. Then the asphalt preparation, mixed with water, is pumped through the pipes and emerges from the other end, spreading out through the earth. Chemicals cause the asphalt particles to combine, producing a mass that water can't penetrate. After the first injection, the pipes are raised and an additional emulsion applied atop the first until the dam is leakproof.

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(Continued from page 93)

were shelved before they got into production. One instance was a box for reading the penlike monitors worn by workers in plants using radioactive materials. Before the first design was in production an electronic reader was perfected to replace it.

The partners have discovered that like nuclear fission, almost everything they have developed in their plant operates in a chain reaction. Take Q-gas.

"We needed a detector for counting soft radiations," said Kuranz. "The ordinary Geiger tube is a cylinder with an axial wire running down the center at high voltage. The inside of the cylinder is a near-vacuum. As rays from disintegrated atoms enter this chamber, positive and negative ions are formed to create a pulse of current. The vacuum necessitates a container that will withstand atmospheric pressure. The thickness of this container is enough to absorb weak radiation before it can get inside the counter. We figured a mixture of the right gases would serve as well as a vacuum. Our present Q-gas—developed with the help of one outside scientist—is composed of an argon and butane mixture, but we are still experimenting and may find something even better.

"After we got a tube to work at atmospheric pressure, we developed our windowless Geiger counter. Samples of radioactive material can be introduced directly into the machine to detect soft rays."

One of the many advantages of the windowless counter is that it can pick up the weak radiations from Carbon 14. This is a favorite radioactive material for medical experiments with laboratory animals and plants. Formerly in studying liver action in rats, lethal doses had to be given because such small amounts of the carbon went to the liver. Now the rats can be kept alive and the liver action studied under normal conditions of body chemistry. This is a tremendous boon to many phases of medical research—including cancer.

The windowless counter was followed by the new Q-gas Geiger tube which in turn brought about the remodeling of Nuclear's portable Geiger counter. Nuclear's old portable contained the conventional costly Geiger tube and high-voltage batteries. The new Geiger counter, which they call Sniffer, is powered by only two small flashlight batteries.

"Our future plans are dependent on how radio-isotopes are applied," said Schoke. "Right now the main application is in the

(Continued to page 268)

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field of research—medical, biological, and to a small degree industrial. We feel that the versatility of radio-isotopes as a tool is tremendous and when industry begins to apply the isotope to its problems, big things are going to happen."

Nuclear is planning a service for studying specific applications for the use of radio-isotopes. Meanwhile many industries are already presenting their problems to the company. One large concern is treating a certain material in 25,000-gallon vats and the problem is to measure the effects of the process.

What do these young and practical scientists think about the future of atomic energy and its applications to our daily life? Will the atom be powering our planes, ships, submarines, automobiles and locomotives and heating our homes?

"We feel that the atom will take its place with other sources of power," said Kuran, "and not necessarily replace coal, oil or other sources. Atomic power will only compete where it is economically feasible. For example, water power is too cheap ever to be threatened by the atom. In the case of public utility power plants, the biggest cost factor is distribution and that will apply to the atomic power plant as well as the conventional plant of today.

"A lot of research is now being done on shielding. Everybody is familiar with the thick shielding now required in atomic power plants to afford protection from deadly radiation. It is possible that a nuclear reaction may convert this radiation into something more absorbable. A neutron can go through a great thickness of steel but thin sheets of cadmium or boron will do a lot to stop it by converting the energy to some other form of radiation. If the deadly gamma ray can be converted to some harmless soft ray it may be possible to build a small atomic engine for a plane or car. The cost factors involved here should be a comfort to the auto builders in Detroit for years to come.

"We feel the big future of atomic power will be in ships and submarines and in packaged power plants. The latter could be used in regions where cheap water power or coal is unavailable.

"In time we hope the public will become more familiar with the wonders of nuclear fission—the things you can do by splitting atoms. Actually it's as simple as electricity and one of these days the word isotope will be as common in our language as radio or television. Electricity can get complicated while an isotope is merely an upset atom that emits useful rays that can be put to work."

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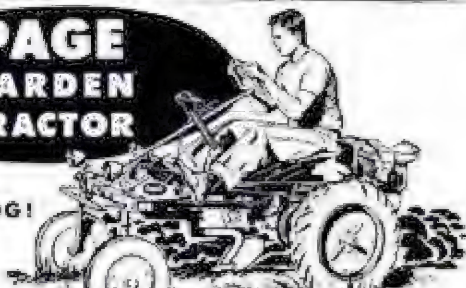
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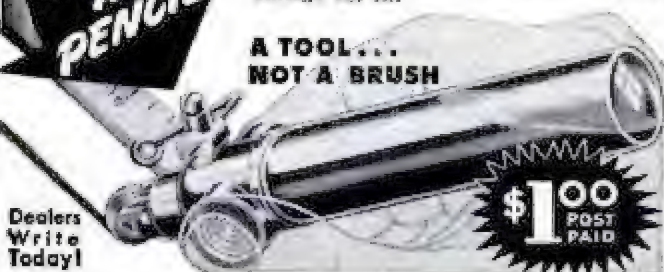
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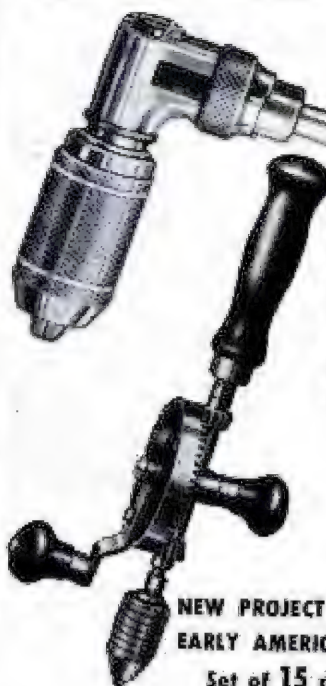
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(Continued from page 138)

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Illumination of the weird undersea world is provided by a 500 and a 1000-watt lamp mounted inside water-filled pyrex tubes for protection against pressure. The lamps are fastened just outside the windows.

In studying a canyon, the benthoscope will be dropped down one canyon wall and then towed across the floor and up the other slope. A powerful tug serves as the mother vessel, with the Velero IV, deep-sea research ship of the Allan Hancock Foundation, University of California, standing by. In case of emergency, the tug is capable of wrenching the sphere free of its wheels and raising it to the surface.

Doctor Barton has made one disappointing observation as a result of his record descent. "I think marine life in the Pacific is much more interesting at 2000 feet than at 4500."

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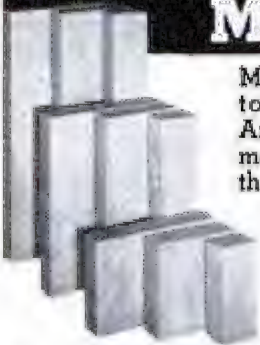
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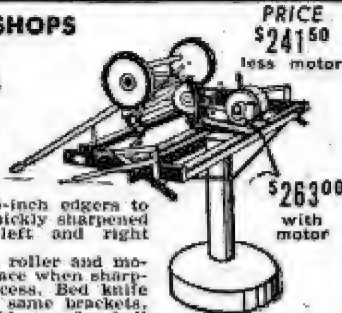
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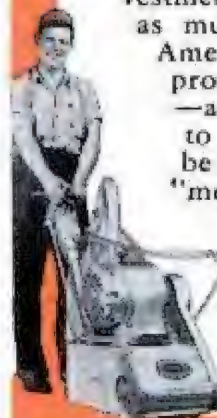


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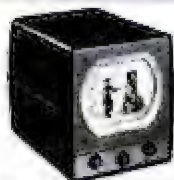
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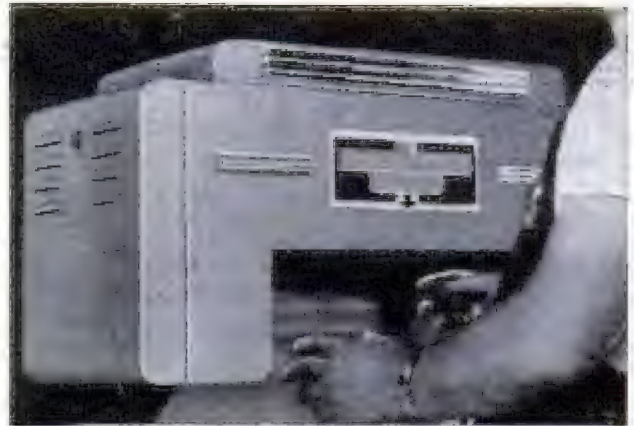
☐ Rush FREE 1950 ALLIED Catalog

Name

Address

City.....Zone.....State

FREE
CATALOG



Electronic Towel

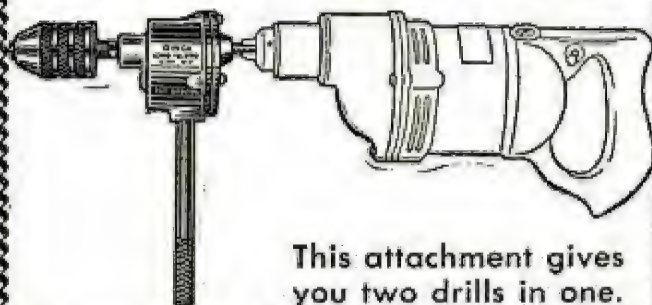
Germes don't have a chance when you dry your hands with an electronic towel that uses ultraviolet rays to evaporate the moisture in less than 30 seconds. There are no switches to operate. You place your wet hands in the horizontal opening under the wall-mounted machine and it turns itself on automatically. When you remove your dried hands, the machine shuts itself off.

Coffee Roasted by Infrared Rays

Coffee can be quickly roasted while you wait by infrared rays with a newly developed machine. It roasts a pound of coffee a minute and is completely automatic. A button is pressed, and the coffee is measured, roasted and released.



2 DRILLS IN 1



This attachment gives you two drills in one.

It converts any 1/4 inch electric drill to 1/2 inch capacity. Reduction gears reduce the drill speed 5 to 1, the average speed of a 1/2 inch drill, and thereby increases the power. Absolutely indispensable for all shop work and home craftsmen. Satisfaction guaranteed. Order yours now.....

\$11.95
post paid

Send check or Money Order with order. Jobbers write for special information.

G. M. CO. MANUFACTURING, INC.

1308 43rd Ave.

Long Island City 1, New York

This is it!
THE LOWEST-PRICED
BALL-BEARING TILT/ARBOR
SAW IN AMERICA!

\$39.50 F. O. B.

Kalamazoo, Mich.
Price includes motor
rail, belt, pulley, mitre
gauge, fence, splitter, guard —
less motor. Extensions \$3.50 each.

THE NEW *Atlas* POWER KING 3001

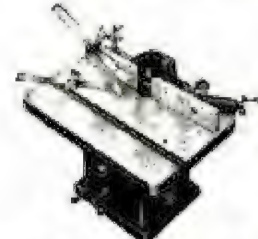
Yes, this is it! Today's outstanding saw value. The new 3001 ball-bearing tilt/arbor Power King... with big saw features... yet priced so low it pays for itself on your first few projects! Send postcard for catalog today.

BIG SAW FEATURES!

- ★ **Tilt/Arbor Construction** — for safer angle sawing.
- ★ **Sealed Ball Bearings** — for smooth, lasting accuracy.
- ★ **Big Capacity.** Cuts 2 1/4" deep, 7 1/8" area ahead of blade, 12" x 16" table.
- ★ **Precision-Ground Grey-Iron Table.** Heavy cast iron table with precision ground easy-sliding surface.
- ★ **Rigid Rip Fence** — full table length, locks securely at both ends, releases instantly for positioning.
- ★ **Table Extensions** — 6 3/4" x 16" added on sides give you 25 1/2" wide table — 12" from blade to fence!

SPINDLE SHAPER

Cuts joints, grooving, mouldings, and edge work to add factory-like beauty to furniture and furnishings projects. The PK wood shaper is low cost, with many extra features. See it at your Power King dealers.



12" WOOD LATHE
36" between centers,
4 speeds, threaded for
outboard turning, ball
bearings. A most un-
usual value!



ATLAS PRESS COMPANY

1035 N. Pitcher St., Kalamazoo, Mich.



MATCHED PRECISION TOOLS FOR
WOODWORKING AND METALWORKING

AMAZING INVENTION

SOLDER-MATIC AUTOMATIC SOLDERING IRON

* AUTOMATICALLY FEEDS SOLDER TO THE TIP OF THE IRON

* LEAVES ONE HAND FREE TO HOLD WORK

* HOLDS OVER A FEET OF SOLDER 1/8" TO 1/2" DIA.

FEED ATTACHMENT REMOVABLE IN A MATTER OF SECONDS, FOR USE ON OTHER IRONS FROM 75 TO 250 WATT-SIZES. Slight pressure on trigger brings solder to the tip of the iron in the exact quantity needed. Speeds production in workshop or factory. Comes complete with instructions. Underwater approved 60-watt version electric wire and its feet of cables. Fully guaranteed — money back or free credit if not satisfied.

C. O. D. add postage — prepaid, we pay postage.

ACT TODAY

THE STERN CORPORATION
219 81 Investment Bldg.
Pittsburgh 22, Pa.

ONLY \$5.95 COMPLETE

DEALER INQUIRIES INVITED

HOME WORKSHOP TOOLS at lowest prices!

CIRCULAR SAW BLADES

"HOME WORKSHOP" — of TOUGH Special Purpose Steel. Ideal for Hobbyists!

4" Crosscut.....	\$.38
6" Comb., Rip, Crosscut.....	1.00
7" Comb., Rip, Crosscut.....	1.35
8" Comb., Rip, Crosscut.....	2.00

BLADES WITH 1 1/2", 5/8", 3/4" BORE ("Hycarbon" also for Mill, Skil, Thor Saws 30c more.)

"HYCARBON" — MASTER QUALITY, of finest TEMPERED HY-CARBON STEEL, HANDFILED

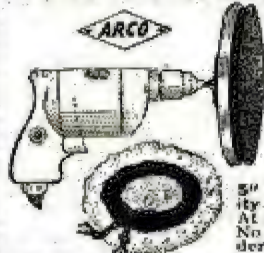
4" Crosscut.....	\$1.60
6" Comb., Rip, Crosscut.....	2.00
7" Comb., Rip, Crosscut.....	2.50
8" Comb., Rip, Crosscut.....	3.00

EVERY ELECTRIC DRILL A SANDER AND POLISHER

Simonize cars, sand floors, walls, furniture, remove paint.

4" ROTARY SURFACE SANDER — boxed with tube of cement and 12 sanding discs, 1/4" or 1/2" shank \$3.50 Features: Sponge Rubber Cushion, Speed Control for immediate replacement of discs.

5" POLISHING BONNET of superior quality. High Pile Lambwool..... \$1.25 At your dealer, Or Order Direct, Postpaid. No C.O.D. — Send Check or Money Order TODAY!



ARROW METAL PRODUCTS CO.

Dept. A, 140 West Broadway, New York 13, N. Y.

Reading, Writing and Aviation

(Continued from page 156)

The school couldn't afford a swimming pool, for instance, yet it has a modern pool today simply because building one was made an instructional project.

A combination auditorium and gymnasium was far beyond the school's purse, but it has one. An old recreation building was found at an Army camp, bargained for, and hauled piecemeal to Weedpatch and re-erected. It's a wooden structure and not fireproof, but its only floor is at ground level. All the wiring has been inspected and plenty of exit doors provided. From the

standpoint of student safety, it will do very well until a permanent building is built.

The modern trend in education is to introduce advanced subjects to school children at an early age and the progressive country school at Weedpatch is demonstrating that the idea works. Academically, the Sunset students are as well grounded in reading and writing and other subjects as any school groups in their county. On top of that, educators who visit the school say that the students at Weedpatch are better mannered, more alert and better informed than most students their age. The school kids themselves agree that "going to school isn't as bad as it might be, after all."

The Most Versatile Tool a Man Can Own DREMEL *Electric* MOTO-TOOL

The "Pocket Size
Machine Shop"

Grinds, Routs, Drills,
Curves, Engraves,
Cleans, Polishes,
Finishes

APPROX.
27,000
R.P.M.



MOTO-TOOL NO. 2
with one emery wheel point
\$16.50



Great for
Hobbyists

Saves Time
and Labor



MOTO-TOOL KIT NO. 2
With 23 Accessories
(High-Speed Steel Cutters,
Grinding Wheels,
Polishing Accessories)
\$23.50

10 REASONS WHY MOTO-TOOL IS A BETTER BUY

Here's what you get in a Dremel No. 2 Moto-Tool: Oil-less, sealed bearings • Patented automatic chuck lock pin • Oversize armature shaft, hardened, ground, polished • Shockproof, take-life housing • Dust filtered air cooling system • Dynamically balanced armature (for vibrationless operation) • Exclusive hanger hook • Sturdy 110-120 Volt AC-DC motor • Weight only 13 oz. • Cutters in Kit No. 2 are made of high speed steel (not common high carbon steel) for longer life, faster cutting.

Portable DRILL PRESS

Add all-around versatility to your Moto-Tool with this 12" high drill press. Just fix clamping for creating custom jewelry, model making, carving, routing, drilling, etc. Utilizes No. 2 Moto-Tool, which can be raised, lowered or swung in any direction. Weighs 2½ lbs.

Only **\$9.95**
(Less Moto-Tool)



Moto-Tools, Kits and Accessories should not be confused with "bargain offers." We invite you to compare Dremel Products feature for feature with other similar equipment. If you are not fully convinced ours are far superior in quality, design and performance, we don't want you to buy.

WIDELY USED IN INDUSTRY — Moto-Tool is a precision-built electric tool, backed by over 13 years of industrial use in such plants as: GENERAL ELECTRIC • FORD • REMINGTON ARMS • NASH-KELVINATOR • WESTINGHOUSE • DOUGLAS AIRCRAFT, etc.

PRE-WAR PRICES STILL PREVAIL

MOTO-TOOL KIT NO. 2 with 23 accessories including high-speed steel cutters and Model 2 Moto-Tool in natural finish hardwood case..... **\$23.50**

MOTO-TOOL NO. 2 with one emery wheel point..... **\$16.50**

WHERE TO BUY — Buy Moto-Tool from your dealer. If he cannot supply you, send check or M. O. for items desired and we will ship postpaid. Or, send only \$2 now and pay postman balance plus postage on delivery. **MONEY-BACK** if not delighted after 5 days' trial. Catalog of Dremel Tools **FREE**.

DREMEL MFG. CO., Dept. T119-K, Racine, Wis.

BIG VALUE!



MODEL NO. 1

MOTO-TOOL KIT
Only **\$17.50**

Moto-Tool Kit No. 1 contains the lighter Model No. 1 Moto-Tool and 34 practical accessories (steel cutters, grinding wheels, etc.) in an attractive, lacquer-finish wood case. It's the biggest bargain **\$17.50** in the field.....
MOTO-TOOL NO. 1 with one emery wheel point... **\$9.85**

THREE TOOLS IN ONE



Potent

Only
\$14.85

POSTPAID



Son, you'll have to wait to sand your boat until I polish some furniture.

A Dremel Sander sure takes the work out of sanding.

DREMEL *Electric* SANDER

Popular Labor Saver for the
HOME and SHOP



MAKES PLAY OF
WAX POLISHING



SOOTHES TIRED MUSCLES
BY MASSAGE

The popular Dremel Electric Sander is more than a sander . . . it's also a polisher and massager. This miracle machine is so easy to handle, a child can use it. It delivers 14,400 strokes per minute. (1) As a sander, it gets into tight corners, takes the effort out of sanding walls, woodwork, furniture, workshop projects, etc. Its straightline (non-rotary) action will not burn or scratch surfaces. (2) As a polisher, it does a professional job on waxed surfaces of cars, furniture, refrigerator cabinets, etc. (3) As a massager, it's ideal for tired or sore muscles of the back, legs or arms. Users testify it is more effective than machines made expressly for this purpose.

LOOK AT THESE DREMEL FEATURES

Dremel Electric Sander does all the work . . . you merely guide it. It weighs only 2½ lbs.; it's foolproof (has only two moving parts . . . never needs oiling). Quick-change clamps firmly hold abrasives and pads. Dremel Sander is sturdily built to give long, trouble-free service. Operates on 110-120 Volt, 60 Cycle, AC. Thousands and thousands of satisfied users prove its outstanding value.

WHERE TO BUY IT — Dremel Electric Sander comes complete with 6 sheets assorted grade Garnet Paper for sanding, plus felt pad and sheepskin for polishing. Buy it from your dealer. If he cannot supply you, use coupon below to order direct from factory. We ship postpaid if you send check or money order in full. Or, send \$2 now and pay postman balance plus postage, on delivery. Money back if not delighted after 5 days' trial.

**If Your Dealer Cannot Supply You
USE THIS HANDY COUPON ORDER FORM**

DREMEL MFG. CO. • Dept. S119-K • Racine, Wisconsin

- ☐ Enclosed find \$_____ (Check or M. O.) in full payment for items checked below. Ship postpaid at once.
- ☐ Enclosed find \$2.00 in part payment for items checked below. I agree to pay postman balance plus postage, on delivery.
- ☐ Dremel Electric Sander \$14.85 ☐ Dremel Electric Coping Saw \$5.85
- ☐ Free catalog of Dremel Electric Tools.

Name _____

Address _____

City _____

Zone _____ State _____



SAFE!
AS A
HANDSAW

**JUST
GUIDE IT!**

Only
\$5.85



For men who harbor a hobby or do their own repair work . . . for boys who like to make things . . . no other tool will give as much pleasure and satisfaction in the home or workshop for the small amount of money invested as a Dremel Electric Coping Saw. It works in any direction . . . delivers 7,200 strokes per minute . . . so easily, there is no effort . . . so smoothly, work needs no sanding. Makes child's play of tricky scroll designs . . . saws through ¾" medium hard wood at a foot-a-minute speed. Touch-of-the-trigger, foolproof action. Saw has only two moving parts . . . never needs oiling. Operates on AC current. Thousands and thousands of satisfied users.

WHERE TO BUY IT—Buy Dremel Electric Coping Saw from your dealer. If he cannot supply you, use the coupon to order direct from factory. We ship postpaid if you send check or money order in full. Or, send \$2 now and pay postman balance plus postage, on delivery. Money back if not delighted after 5 days' trial.

Plan for making six useful decorative projects packed with each Dremel Electric Coping Saw.

DREMEL MFG. CO. • Dept. S119-K • Racine, Wis.

It's FALL...Time to Change your Oil Filter!

A refill now cuts repair bills later



MONEY-SAVING TEAM
New oil and a Purolator Micronic Refill to keep it free from abrasives. Result, top engine performance, lower repair bills.

DON'T TAKE A CHANCE, TAKE A LOOK. Sludge and abrasives play hob with engines, lead to expensive repairs. Replace that choked-up oil filter now!



QUICK-CHANGE, SMALL-CHANGE JOB. Your favorite serviceman inserts a Purolator Micronic Refill in a few minutes. Traps all the abrasives; costs only \$1.38 to \$3.*

● If your car is not equipped with an oil filter, \$6.50 or a bit more* buys the best there is, a Purolator Oil Filter. See your service man soon. Purolator Products, Inc., Newark 2, N. J., and Windsor, Canada.

(*Depending on make of car.

Purolator

MICRONIC OIL FILTER

*Clean oil = a clean engine =
lower repair bills*



The Ship That Rides on Air

(Continued from page 124)

with his mechanic, Orlin Johnson, on the Detroit River. They were drumming over 105 miles an hour when suddenly the boat disintegrated. Engines, splinters and men went flying in all directions. Wood came to under water, battered by debris, and floated to the top where he was rescued. Johnson had to be hauled up, unconscious, with smashed jaw and cut neck. Johnson, his head in a cast, and Wood, smothered in bandage and tape, built another boat and won the Harmsworth a few weeks later. That boat did not disintegrate. "You don't forget those things," he notes.

All his savvy in construction detail went into the new Venturi. Her hulls are planked in 5/8-inch mahogany plywood, with a double thickness of 3/4 inch below the waterline. Cross trussing, connecting the deck across the two hulls is of one by five-inch oak boards, bolted and spaced on three-foot centers. He was careful to distribute masses of the two hulls so that the center of gravity would not put too great a stress on the upper or lower chords of the cross trusses. "Most people," he says, "—including an admiral who should have known better—think there's danger of the Venturi doing a sort of 'split.' They forget there's no such outward strain, because there's just as much water on one side of each hull as is on the other." Distribution of weight is such as to place the lower chords of the trusses in compression and the upper chords in tension. Thus, wave action against the inside of the hull bows automatically neutralizes the stresses.

The Venturi's beam is 40 feet, and breadth of each hull at the widest place is eight feet. This is about two thirds of the way aft, where the engines are located. The main deck is about 22 feet off the water.

The ship was first launched in 1944, presumably to be used as a radio-controlled target vessel for bombers. She was strong enough to support 46,000 pounds of armor plate, and still have a safety factor to spare—in spite of the fact that her truss spacing and timber sizes are what you might usually find on a ship half her size.

Wood had quite a time retrieving her after the war, simply because of her queer looks. The maritime commission had her listed in its inventory as "a shelter for small boats." He finally recovered her this summer, and in typical Wood fashion, practically rebuilt her.

Today, the Venturi is full of Gar Wood tricks. Instead of installing big, flat fuel tanks, he has 12 vertical drums perched in

(Continued to page 278)



Now—a genuine Delta® Homecraft Tilting-Arbor Saw for only \$64⁹⁵!

(without side-table extensions, saw guard and splitter, or motor)



New 8" bench model Only \$6.50 down

A genuine Delta Homecraft tool at an amazingly low price! One of the most versatile tools a hobbyist can own — for woodworking fun and healthful relaxation . . . for saving money on repairs around the house!

A Real Value

You'd expect to pay much more for this new Delta Homecraft bench model. Here's why:

1. All working surfaces are *cast iron*, for maximum rigidity.
2. Its saw arbor runs on lubricated-for-life ball bearings.
3. It performs all operations commonly done by larger, more expensive machines of its type.
4. It cross-cuts and rips stock up to 2 1/4" thick; it miters and bevels.
5. Accessories are available for all dado and moulding operations.

From start to finish, it's a machine you can be proud to own!

Put It In Your Shop

Your Delta Homecraft dealer can show you this new bench-model Delta Homecraft 8" Tilting-Arbor Saw. See a demonstration at your dealer's today!

If you don't know who your Delta Homecraft dealer is, send coupon below to us. We'll send you your dealer's name and address — and also a free book, "How to Start Your Home Workshop."

POWER TOOL DIVISION



Rockwell

Manufacturing Company

MILWAUKEE 1, WISCONSIN

Free Book

"How to Start Your Home Workshop"

Page after page of ideas, tips, and pictures to help you in planning and getting started. Tells about shop location, lighting, hand tools, etc. For your copy, send coupon at right.

TEAR OUT COUPON AND MAIL TODAY!

Power Tool Division
ROCKWELL MANUFACTURING CO.
6814 E. Vienna Ave., Milwaukee 1, Wis.

Send me the name and address of my Delta Homecraft dealer — and also your free book, "How to Start Your Home Workshop."

Name.....

Address.....

City.....(.....) State.....

HM-71

GROBAN'S WAR SURPLUS SPECIALS!

Be Prepared with an Auxiliary AC LIGHT PLANT GENERATOR

IDEAL FOR: • Home Lighting
• Hunting Lodges • Stand-by
electricity • Running all AC elec-
trical appliances incl. fans, motors,
electric razors, refrigerators, in-
cubators, etc.

Protection for emergencies to op-
erate oil burner, stoker, freezer,
water pump and lights. These units
built to exacting Signal Corps spe-
cifications are the answer to your
lighting needs. Drive it with a 2½
H.P. gasoline engine at 1800
R.P.M.

• 800 watts • 0-150 voltmeter
with regulator • 110 volts-60
cycle, AC. Ship. wt. 60 lbs.

(ITEM #67)

AN OUT-
STANDING
VALUE
for.....

\$59.50

F.O.B. Chicago

BRAND NEW



Hydraulic Cylinders-Air or Oil



Use hydraulics on arbor presses, hydraulic presses, hay
lifts, manure loaders, lift trucks—push or pull, tilt or
turn, press or squeeze, open or close, lift or lower—and
other hydraulic and industrial applications. Use with
either air or oil... of finest precision workmanship.

BRAND NEW

ITEM #4—Double action, 1" bore, 3" stroke, will lift 770
lbs. in 1/10 of a second using Logan Pump. All steel
barrel. Ideal for controls, door openers, posi-
tioning, etc. An \$18.00 value..... **\$4.95**

ITEM #32—Double action, 1½" bore, 6" stroke will lift
1760 lbs. in one second with Logan Pump. **\$10.95**

Wt. 4 lbs. A \$43.00 value..... **\$12.95**

ITEM #16—Use these cylinders on farm trucks, bull-
dozers, hay lifts, manure loaders, etc. Double action,
1½" bore, 27" stroke. (Will lift 1760 lbs. in 2 seconds
with Logan Pump. Wt. 8 lbs. A \$53.00 value..... **\$12.95**

hydraulic cylinder value for only..... **\$14.50**

ITEM #17—Double action, 2¾" bore, 8" stroke. (Will
lift 4400 lbs. in one second with Logan Pump. Will
withstand 1500 P.S.I. against wall. Wt. 7 lbs. A \$65.00 value..... **\$16.50**

ITEM #20—Double action 2¾" bore, 4" stroke, two-way
solid ¾" alloy steel shaft (will lift 4400 lbs. in one
second with Logan Pump). A \$73.00 value..... **\$19.50**

ITEM #15—Double action, 3" bore, 3½" stroke. All steel
hydraulic cylinder, will lift up to 12,000 lbs. (7000 lbs.
in 3 seconds with Logan Pump). Complete with fittings.
Wt. 12 lbs. A \$78.00 value..... **\$22.50**

ITEM #31—Double action, 3½" bore, 11" stroke. (Will lift 6800
lbs. in 7 seconds using Logan Pump.) Complete with
fittings. Wt. 15 lbs. A \$92.00 value..... **\$27.50**

ITEM #6—Double action, 3" bore, 23" stroke, hydraulic cylinder
will lift 7070 lbs. in 3½ seconds using Logan Hydraulic Pump.
Especially suited for farm and construction machinery. Clevis
mounting for easy use. Wt. 22 lbs. A \$145.00 value..... **\$32.50**

F.O.B. Chicago

ITEM #42—Double action hydraulic cylinder. 4" bore, 18" stroke.
Rated lift capacity with 1000 P.S.I. input is 12,580 lbs. using
Logan Pump. Ship. wt. 30 lbs. F.O.B. Chicago. **\$32.50**

AN EXCELLENT VALUE for.....

HI-PRESSURE FITTINGS for cylinders and valves available at
35c ea. for ¾" pipe and 50c ea. for 1½" pipe.

HYDRAULIC CONTROL VALVES

LOGAN Heavy Duty Oil HYDRAULIC CONTROL VALVE



BRAND NEW control valve with built-in adjustable re-
lief valve, will operate one double-acting hydraulic cy-
linder or two cylinders as one or a reversible hydraulic
motor. Valve handle latches in neutral position. Made
of rugged cast aluminum alloy. Open center unloads the
pump in neutral position. Throttling control allows
operator to regulate the speed of movement of the hy-
draulic cylinder or motor. Has removable mounting
brackets with 4 bolt holes, ¾" pipe thread
connections. Overall dimen.: 12½" H x
8½" D x 8" W. Ship. Wt. 17 lbs. Govt. **\$21.95**

Acquisition Cost over \$100.00.

(ITEM #37) AN EXCELLENT BUY FOR..... F.O.B. Chicago

Brand New



ITEM #24—Four way control valve for use with
double action hydraulic cylinder, may be used with
1500 P.S.I. hydraulic system to open and close
hydraulic cylinders. Brand new. Ship. **\$7.95**

Wt. 4 lbs. A \$38.00 value..... **\$10.95**

ITEM #26—Four-way control valve for use with
two hydraulic double action cylinders. Each cy-
linder may be operated independently of the other or in conjunction
with the other. Oil may be locked in any of the cylinders to hold
the piston at any required position. Brand New. **\$14.95**

Ship. Wt. 6 lbs. A \$50.00 value..... **\$14.95**

ITEM #28—A two cylinder double action valve with a unique ar-
rangement, allowing the operator to raise both cylinders simul-
taneously, to lower them simultaneously or to raise one and lower
the other at any predetermined rate and speed. Brand **\$14.95**

New. Ship Wt. 8 lbs. A \$75.00 value..... **\$14.95**

GROBAN SUPPLY CO.

DEPT. PM-10, 1507 S. MICHIGAN AVE., CHICAGO 5, ILLINOIS

the 27-foot hull spaces, holding from 1200 to 2000 gallons each. Thus, he eliminated the necessity of building complicated baffles to keep the liquid from shifting around. The ship has a cruising range of 3000 miles.

The engines are another Wood innova-
tion. Each propeller is driven by a pair of
1200-horsepower G.M. pancake diesels in
tandem. To make two engines work on one
propeller, he used a system he had devised
for the Miss Americas. One drives directly
on the main shaft; the other turns a short
shaft that goes into a gearbox which, in
turn, delivers belted power to the main
shaft. Thus, two engines turn one shaft
without having to be in perfect "synch." No
real speed tests have been run yet, but
Wood expects "to get her up over 40."

Both propellers have variable pitch, elec-
trically controlled from the bridge. The en-
gines have no reverse gear, but by simply
reversing the propeller pitch, Wood can
back up quickly and easily without, as he
says, "a lot of engine-room acrobatics and
bell banging." For docking, he has a porta-
ble pitch-control lever which he carries out
on deck, trailing wires, so he can look over
the side and see how close he's coming.

Though the ship has a conventional
wheel on the bridge, the inventor hasn't
bothered to hook it up yet. Rudders are
turned electrically. "It's so goldarn much
easier," he explains, "but we'll keep the
wheel for tradition's sake."

With two rudders to consider, the speed-
boat king wanted no complicated synchro-
nizing apparatus that might go out of
whack. So he ran simple rudder rods up
to the stern to the deck and fastened them to
big metal quadrants, which are tied in to-
gether with cable. When one turns, the other
goes with it.

With all these innovations, Gar Wood is
not finished improving his dreamboat. "The
reason she rides so smoothly," he points
out, "is because she's half airplane. All her
surfaces are airfoils. The tunnel gives her
'lift' which keeps her from bobbing, pitch-
ing or rolling. In 10-foot seas, as much as
60 feet of her hulls have been out of water,
bridging wave crests without dropping
down. She's riding mostly on air, and
we're going to make the Venturi ride on
even more air."

Here's how he'll do it: Edges of the long,
flat bottoms of the hulls are bound to the
hull sides by protective L-shaped metal
strips, ½ inch thick. This means there's a
hull-wide groove ½ inch deep running the
whole length of each bottom, and the in-
ventor has devised a way to fill it with air.
Holes will be drilled along the bottoms

(Continued to page 280)

All Merchandise Brand New - Order Today - Satisfaction Guaranteed!

LOGAN Heavy Duty Oil HYDRAULIC PUMP

BRAND NEW... for operating hydraulic cylinders and hydraulic motors on tractors, bulldozers, construction machinery, lift trucks, industrial applications, etc. Delivers 8 GPM at 1200 RPM at 1000 P.S.I. using 3/4" H.P. Has 1/2" pipe thread inlet, 3/4" pipe thread outlet, 3/4" shaft with flat and key-way for direct or pulley drive. Has flange with 4 bolt holes for convenient mounting. Ship. wt. 22 lbs. Overall dimen.: 7" L x 5 1/4" H x 3 1/4" W. A \$195.00 value. FOR ONLY

\$22.50



F.O.B. Chicago (ITEM #20)

HANNA AIR CYLINDER

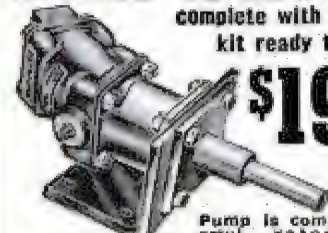
Used for heavy duty industrial applications on shop air lines or with low pressure systems. With 100 lbs. of air pressure, will deliver 1900 lbs. pressure at the ram shaft. All steel construction. Adjustable cushions at both ends of cylinder. Shaft dia. 1 1/2". Foot mounting with clevis on ram shaft. 2 1/2" double-acting stroke; 5" bore, 40 1/2" overall length closed, 7" overall width. 88 1/2 lbs. net wt. Gov't. acc. cost \$101.85. AN EXCELLENT VALUE for... F.O.B. Chicago



\$39.50

VICKERS MF9 HYDRAULIC PUMP or MOTOR

complete with mounting kit ready to install



\$19.90

POST-PAID \$75.00 value

Pump is compact, powerful, rated 1,000 P.S.I., 502 cu. in. per revolution. 8 gal. per min. at 3750 RPM. Change rotation by reversing flow. Delivers up to 6 H.P. Requires 1/2" to 5/8" H.P. to drive directly or by pulley. BRAND NEW. Mounting kit has been especially designed to provide maximum utility and ease of mounting. MF Series Vickers Pumps, brackets are constructed of heavy steel plate; shaft is made of 1/2" steel with one end splined to fit pump; other end of shaft has machined flat for mounting a standard pulley with 1/2" hole. Shaft runs in oilite bronze bearings. PUMP ONLY (ITEM #18). \$14.95 postpaid MOUNTING KIT ONLY (ITEM #38) \$4.95 postpaid BOTH AS COMPLETE UNIT (ITEM #39) \$19.90 postpaid

ADJUSTABLE RELIEF VALVE (ITEM #34) \$2.95 post-paid

HYDRAULIC FLUID (ITEM #53) \$1.75 per gallon F.O.B. Chicago

10 ft. length of Hi-Pressure HYDRAULIC HOSE, with 1/4" female pipe thread fittings. (ITEM #27). \$3.95 F.O.B. Chicago

Brand New HYDRAULIC TANK, 3 gallon capacity with oil-indicator cap. 4" x 12" x 13 1/2". Ship. wt. 13 lbs. NOW AT THIS LOWEST PRICE. (ITEM #58). \$4.95 F.O.B. Chicago

Brand New Gear Type INSECTICIDE PUMP

All Manganese Bronze for spraying D.D.T., 2-40, Sulphur Compounds, Etc. Pressures up to 150 lbs. to 14 gallons per minute—1500 RPM. Will not rust. Standard pipe thread port. Wt. 10 lbs. Dimen.: 8" x 5" x 8 1/4". Standard 1" manganese bronze shaft with key-way. U. S. Gov't. Acquisition Cost \$62.00. NOW ONLY (ITEM #50) \$15.00 F.O.B. Chicago

CENTRIFUGAL PUMP BELT DRIVEN

Ready for use on any Liquid Pumping Need

Use it for DRAINING BASEMENTS • HOME WATER SYSTEMS • IRRIGATION • STOCK WATERING • FIRE PROTECTION • DRAINING PONDS, TANKS, etc. • INDUSTRIAL PUMPING

A super value for all types of intermittent service in pumping large volumes of liquid in home, farm and industrial service. Ideal for home water systems, drainage basements, fire protection, etc. On the farm for watering stock, draining ponds, sprinkling, etc. In shops and factories for all types of pumping service.

MOVE LARGE VOLUME QUICKLY

When operated at 1750 RPM, will pump 42 gallons per minute on a 23 foot head; at 3600 RPM on 52 foot head will pump 88 gallons per minute. May be run with electric motor, gas engine or power take-off on tractor.

COMPLETE ENGINEERING REPORTS AND OPERATING INSTRUCTIONS FREE WITH PUMP

Pump has cast aluminum housing—accurately machined bronze impeller vanes. Complete with mounting bracket and 3/4" V belt pulley. Shaft rotates on sealed ball bearings with grease run fittings. Has 1 1/2" threaded intake flange, two 1 inch outlets. Use one or both, as necessary. Made for Packard Motor Car Co. for use in Rolls-Royce Merlin Aircraft engines.

GREATEST PUMP VALUE IN YEARS

Shipping weight 25 lbs. You can't beat this value at anywhere near this price. Satisfaction guaranteed. Original Cost Approx. \$147.00. (ITEM #64)

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For Any Welding job, light or heavy

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Now AT A FRACTION OF ITS VALUE **\$99.50**

Price includes double V or flat belt pulley and instruction book. Ship. wt. 95 lbs. F.O.B. Chicago. (ITEM #65)

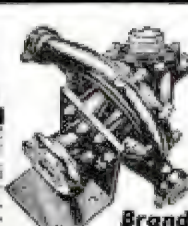
Only one or two jobs will pay for entire welder. ACCESSORY KIT including welding helmet, electrode holder, two 10 ft. cables with clamp, and 5 lbs. of assorted welding rods. (ITEM #66). **\$10.50**

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Write for free copy of our 40 page catalog including Hydraulic Manual featuring diagrams, photographs and instructions. Catalog lists excellent war surplus values: pumps, valves, hydraulics, lights, motors, etc.



Brand New

ROSS 4-Way Foot Operated AIR VALVE

MODEL 398 BRAND NEW. For double-acting pneumatic devices. Fine for operating presses, air vises, air machinery of many types. Heavy duty cast construction. No neutral position. Maintains pressure against the piston when the foot control is in the "Up" position. Threaded for 1/2" pipe. Dimensions of valve body: 7 3/4" L x 4 1/4" W x 7 1/2" H. Net wt. 28 lbs. A \$64.00 value for only (ITEM #60) **\$19.50** F.O.B. Chicago

LOGAN 4-Way Foot Operated AIR VALVE

MODEL 6520 BRAND NEW. For double-acting pneumatic devices. Fine for operating air vises, presses, air machinery of many types. Heavy cast construction. Threaded for 1/2" pipe. Dimensions of valve body: 8 1/4" L x 5 3/4" W x 7 1/2" H. Net Wt. 28 lbs. Gov't acquisition cost \$42.00. AN OUTSTANDING BUY AT... (ITEM #59) **\$15.00** F.O.B. Chicago

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Use these tanks on compressors, for tire inflators, pulsation chambers, float valves, hydraulic reservoirs, fluid and milk containers, fuel containers, etc. Tough, light: 450 lbs. P.S.I. Aviators Breathing Oxygen bottles, type G1, 2100 cu. in. (approx. 9 gallons) int. vol. 2 1/4" x 12 1/4" threaded openings at each end. Wt. 10 lbs. .051" thick. (ITEM #63) **\$4.95** F.O.B. Chicago

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MINIATURE High Speed ELECTRIC MOTOR

IDEAL FOR MODEL BUILDERS, MODEL RAILROADERS, EXPERIMENTERS, HOBBYISTS. AC or DC. Reversible, speed may be regulated by varying voltage. Has miniature Klaxon thermo-static switch. All connections are external and accessible. Has 3 mounting feet for easy installation. Double-end ball bearing supported shaft with small gear on one end. Die-cast housing with laminated field. Overall Dimen.: 3 1/4" long x 2 3/4" wide x 1 3/4" high. Net wt. 12 oz. A \$22.00 value. (ITEM #5) **\$2.95** post-paid

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Ideal for raising, lowering, leveling and adjusting. Use on ladders, machine tools, toys, etc. Overall length closed 9 inches, open 14 inches. Worm gear box with 54 to 1 reduction with double end drive shaft. Use either end or both. Extension screw shaft 30 to 1 reduction. \$35.00 value. AN OUTSTANDING BUY. (ITEM #45) **\$3.95** postpaid

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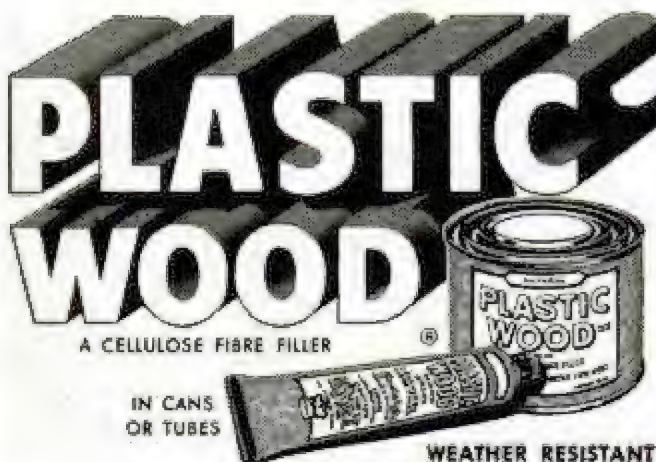
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Repair loose tiles—

Holds tiles firm on wall! Easy!



Also useful in filling cracks in floors, nail and screw holes, repairing broken toys. Handles like putty . . . hardens into wood!



of the hulls and pipes fitted into them. The pipes will run up to a point above the waterline, so the ship won't sink. Then, the holes will be covered on the hull bottom with metal scoops, opening aft. As the ship moves forward, a vacuum will be created behind each scoop, sucking air out of the hull and along the flat bottom. "We'll practically be flying then," says Wood.

With so shallow a draft, and so much of the Venturi out of water, Wood has had to figure a way to keep a stiff wind from pushing her around. The solution is a hydraulic arm—like an aircraft's landing gear—which will lower into the water from the ship's Venturi tunnel roof. Instead of a wheel at the bottom, there will be an outboard motor on a swivel. Its propeller will dip into the water in the direction of the wind, and its speed regulated exactly to counteract the wind. The device is expected to be a big asset in docking and, on larger Venturi ships, might even eliminate the necessity for tugs.

Wood is also building a 20-foot, twin-screw fishing cruiser with a collapsible flying bridge. This will fit on block-and-tackle slings snug against the Venturi's tunnel ceiling. A hatch through the ceiling will permit the fishing party to climb into the cruiser. "Then," says Wood, "I'll just push a button, start a winch, and we'll be lowered into the water without lifting a finger."

Right now the inventor is busy completing a livable deck, with cabins and a bow end entirely of glass. Its forward end will have an airfoil curve to complement the winglike lift of the tunnel. All cabin partitions, unlike most boats, will tie into the bracing structure and add strength and support to the whole ship—rather than just weight.

Wood likes to remind enthusiasts, however, that the Venturi is still experimental. "We still don't know all the things she'll do or won't do," he says.

During the test runs last month, for instance, the propeller-pitch gadget conked out momentarily, and the ship whammed into the dock. "We'll make some pitch controls in our own shop, goldarnit," he shouted, "and then they won't give us trouble."

He's just the man who can do it. Gar Wood is a firm believer in self sufficiency, and he has a formula for how to be happy. "All any man needs," he says, "is four things—a good job, good health, a good religion and one goldarn good hobby."

Ⓛ Built by a 17-year-old American, a model plane recently set a new world record for speed in a straight line. The gas-powered model, traveling 81.587 miles per hour, was 15 m.p.h. faster than the old record.

BOYS! This coupon may send you to college!

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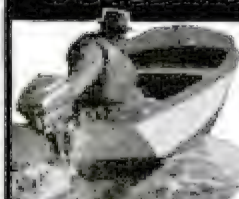
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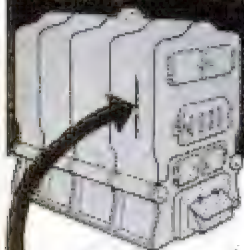
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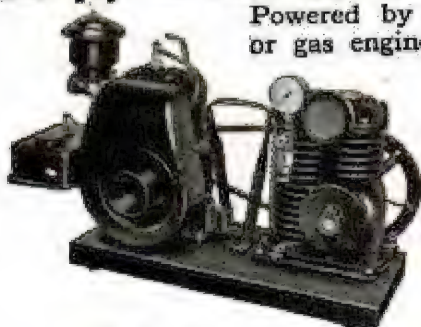
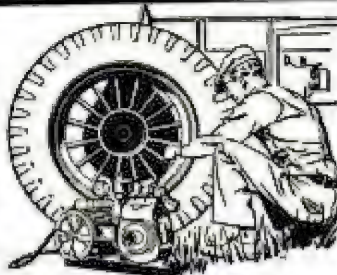
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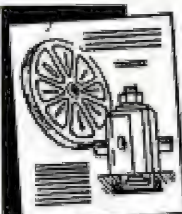
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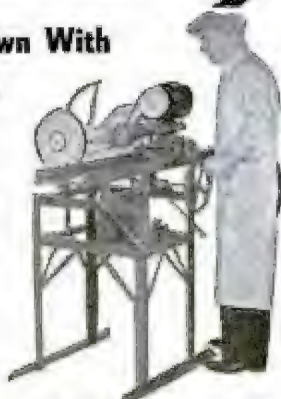
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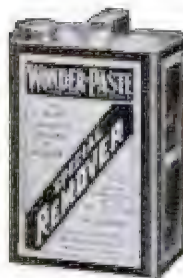
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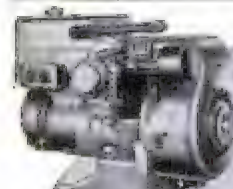


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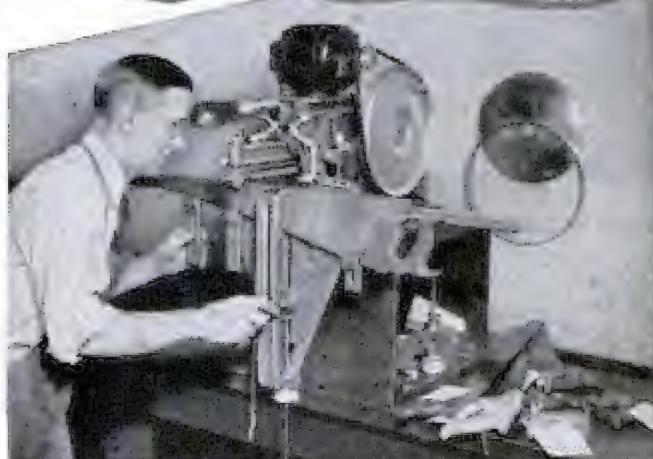
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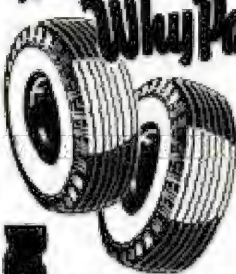
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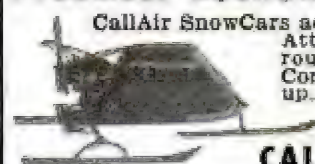
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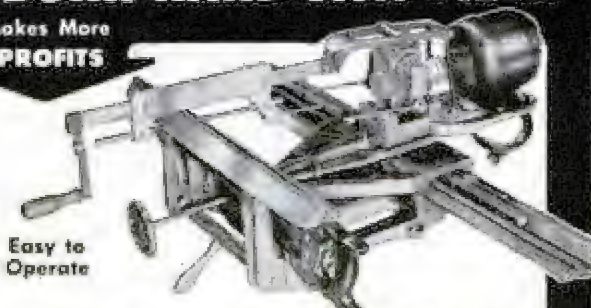
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Every Motor Fully Guaranteed

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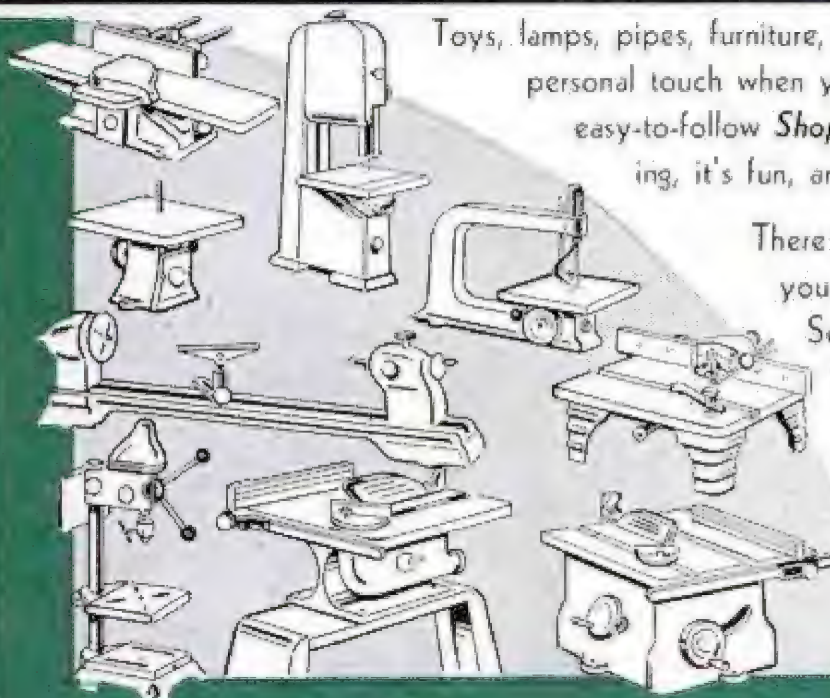
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- 53 Child's Wagon
- 54 Coaster Set and Rack
- 55 Toy Duck
- 56 Broom Holder
- 57 Novelty Tie Rack
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- 59 Pull Toy Train
- 60 Gun Rack
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Tool Purchased _____ Registration Card No. _____
Dealer _____ Buyer _____
Address _____ Address _____
Signature _____ City and State _____

Redemption made by Dealer _____ Plans to be mailed direct to customer _____

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This coupon is void if prohibited, torn, or used in your store or locality.

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Flex-O-Shaft

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and complete
Tool Kit with
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ONLY

\$50.00

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No more slowdowns... it takes less than **TWO MINUTES** to repair a blade with the Erwood Band Saw Brazier. And you save money too... do inside contour sawing easier and faster. No wasting broken blades... make your own band saws from coil stock. 110 or 220 volt. Complete with kit.

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5 ROWBOATS 8 to 14 ft.
6' OUTBOARDS 12 to 16 ft.
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Say You Saw It in Popular Mechanics

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pipe with genuine im-
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Here's a Sensational PIPE OFFER!

3.50

only **50¢**

plus the inside
paper wrapper
from 12 tins of
Holiday Pipe
Tobacco.

Offer limited to U.S.A. Expires Dec. 31, 1949
Send to Holiday, Dept. PM-1, Richmond, Virginia

Also in vacuum pounds



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MIXTURE**

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"Never again will I use putty,"
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FUN TO WORK WITH

Unlike putty, "33" goes on
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Won't dry out in opened can. De-
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7 TOOLS IN 1
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★ **NEW**
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The finest low-priced drill press in America is ready for your inspection! Industrial, commercial, and home shop men have long known the many quality features of the Atlas drill press. Now come new improvements that make it better than ever.

Four ball bearings in the head give you a "floating drive" that is smoother and dependably accurate for years. The new depth stop is more convenient, and the heavier construction adds to smoothness and accuracy on heavy drilling in metal or high speed work on wood.

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Draw an area 26¾" x 22" (table size of this saw, as shown) and you'll quickly see why it's the most popular low-cost circular saw on the market. Use the coupon for latest catalog with full details.

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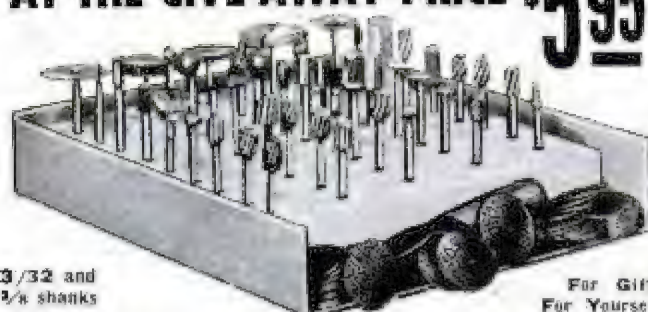
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3/32 and
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A 50c FOUNTAIN PEN FREE WITH ORDER. The best gift you can give to the hobby worker. We give you saws, drills, routers, carriers, emery disks, polishing compound, reamers, borers, shapers, stone points, grinding points. About 150 pieces that we went out and priced in other stores for over \$20.00 for half of what we sell for \$5.95. In addition to the above we include a dozen saws and a 60c mandrel. After receiving set, if you don't think it is worth what we say, send it back. Your money refunded.



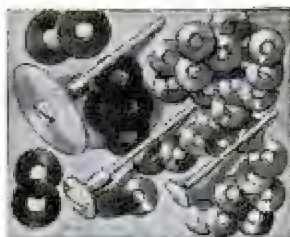
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Just plug it in and spray.
24 oz. capacity. Fast, economical for paint, varnish, oils, insecticides, etc.

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25 ASSORTED SAWS

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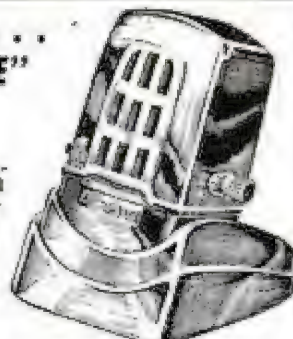
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Hundreds of Other Truck & Jeep Parts and Supplies
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A-B & thru '38. Install Hydraulic Brake system now—Be SAFE. Complete kit includes everything needed—Cylinders, brake plates, lines, brackets, hoses, easy to follow instruction. Easy to install in 8 hours. Satisfactory operation guaranteed. Order Direct! Complete kits only **\$75.00**. Los Angeles. \$25 deposit on C.O.D. Return old brake plates for \$10.00 refund.



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Brand new web type belts in the original package. **ONLY \$3.95**

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Without straps Used, good **ONLY \$1.50** Per Pair

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Excellent as an automatic timing device for turning off electric signs, store lights, etc. Hundreds of other uses.

110 V. — 60 cycle — 2 watts
1/10th rev. per hour



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Send 10c for our Jam-packed Catalog!
Enclose full amount with order. All Equipment F.O.B.

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FOR 15" OR 16" TIRES

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550-16	\$3.54	30-5	\$ 7.98	1200-20	\$18.78
600-16	3.59	650-20	7.69	750-24 (36-6)	12.21
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700-16	4.59	700-20 (10)	12.48	1000-22	17.70
550-15	3.79	750-20 (8)	8.19	1100-22	16.89
650-15	3.89	750-20 (10)	9.19	900-24 (40-8)	21.60
700-15	3.98	825-20	11.19	900-16	8.98
550-17	5.60	900-20	11.89	825-15	(14 ply) .. 14.10
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Exceptionally good tread — No recaps — With a
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650-16	5.29
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650-15	4.98
825-20	15.98
900-20	15.98
1000-20	16.89
700-15	\$ 5.29
600-20	9.75
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32-6 (8)	10.49

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Will fit 650 x 20	700 x 20 (8 & 10 ply)	34 x 7 (8 & 10 ply)
Special	\$10.49	Guaranteed 12 months
Superior Quality	12.98	Guaranteed 18 months
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Exclusive GIL-BILT Build-It-Yourself Features

- No machining—build easily with hand tools only
- No blueprint reading—step-by-step pictorial plans, full scale patterns, actual photographs
- Sturdy wood, aluminum, and steel construction
- Capacity and performance of commercial saws selling for \$60 and up

**SAVE
\$50
OR MORE**

GIL-BILT 10-INCH TILTING ARBOR SAW



- 27x28 in. table, 13 1/2 in. capacity in front of blade
- 10 in. blade cuts 3 1/4 in. deep, tilts full 45 degrees
- Floor model 34" high, table always stays level

- New Departure ball bearing arbor, 3/4" precision shaft turned down for 3/8" bore blades, alum. housing, shipped ready to run
- Jackscrew and 4 1/2 in. dia. handwheel lowers and raises blade
- Cast aluminum miter gauge and self-aligning rip fence guide

GIL-BILT Metal Parts Kit includes Plans, ball bearing arbor, miter gauge and bar, rip fence guide, dado insert, lock knobs, jack screw mechanism and handwheel, and all other metal parts (less blade)

Same Kit with 10" Combination Blade \$20.95

Same Kit with 8" Combination Blade \$23.00

GIL-BILT 12-INCH BAND SAW



- Cuts to center of 24 inch circle
- Handles stock up to 6 inches thick
- 18x18 inch table tilts 45 degrees
- Lower wheel and drive pulley runs on sealed New Departure Ball Bearings; Upper wheel runs on two 3/4" bore Oilite Bronze bearings
- Upper wheel tension and tilt mechanism of cast aluminum, completely assembled
- Upper and lower blade guides. Each has ball thrust bearing, self-lub bronze jaws
- Rubber tired wheels. Choice of cast aluminum or make-your-own wood wheels on metal hubs
- Uses standard 78 inch blades up to 3/4 in. wide
- Fully enclosed mechanism for utmost safety

GIL-BILT Metal Parts Kit includes Plans, rubber tires, 3/4 inch blade, hubs for wood wheels, ball bearing spindle, tilt mechanism, guides, table tilt segments and all other metal parts

Same Kit with two machined ready-to-install 12" cast aluminum wheels

Return in 10 days for full refund if not satisfied.

(Prices include postage within 600 miles. Over 600 add 5%.)

Also available—Plans and Parts Kit for 8" Tilt/Table saw, Order Plans at \$1.00 each—sent postpaid anywhere in the world or write for FREE descriptive catalog.

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NOVEL Electrical GIFTS For HOME and WORKSHOP!



A few of the hundreds of articles

Syncro—and only Syncro—can hone sharp safely!

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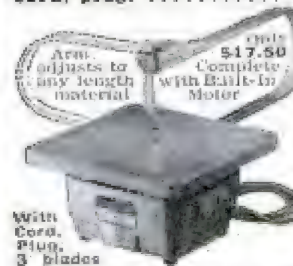
Here's the first and ONLY HONE Electric Sharpener—the only ALL-PURPOSE machine that gives you 14,400 gentle, genuine HONING strokes a minute! Invaluable for kitchens, workshops, homes, cafes, commerce and industry! A novel, practical GIFT. SAFE. No belts, gears, wheels! 60 cycle, 110-120 volt AC. Insist on SYNCRO ALL PURPOSE Electric HONE Sharpener! With 3 Honing Stones, cord, plug, switch, only.....

\$10.50

2. New Sander-Polisher!

New SYNCRO does better, faster job. Light. For light sanding—polishing autos, shoes, etc. 14,400 "POWER" Motion strokes a minute! 60 cycle, 110-120 volt AC. With 9 sheets Aluminum Oxide sandpaper, felt and virgin lambswool pads, 8 ft. cord, plug.

\$14.50



3. Safe Electric Jig Saw

Safe for children yet power enough for adult workshop. Portable. THOUSANDS SOLD. Adjustable arm permits any length cut. Not for "lumber-cutting" ... for fine craft work in wood, plywood, thin metal, plastic. Complete with built in motor,

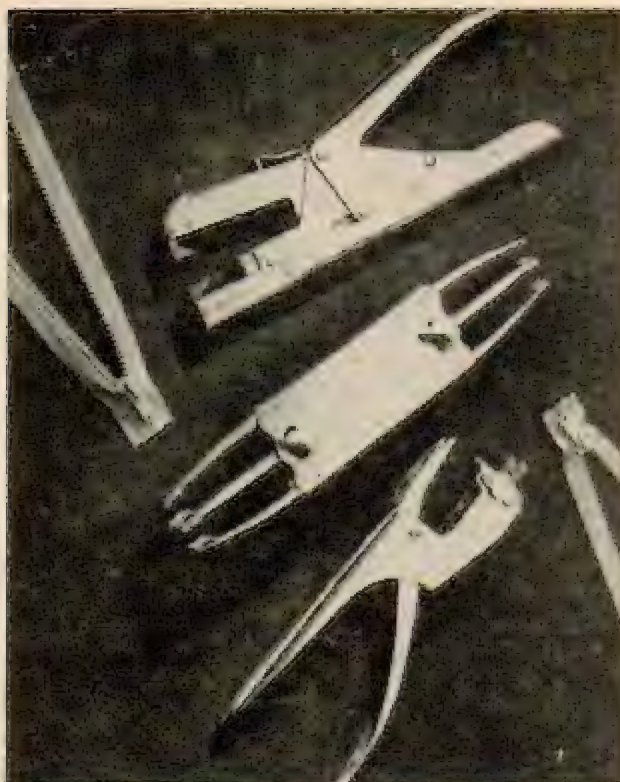
\$17.50

Run at Dealers. If he hasn't SYNCRO, order direct. Send full amount—we ship prepaid.

DEALERS! Write for new SYNCRO "BIG 3" Profit Facts.

SYNCRO

QUALITY ELECTRIC PRODUCTS
SYNCRO CORP., DEPT. H-109, ROCHESTER, MICHIGAN



Zipper Repair Kit

Zippers that have jammed due to fabric being caught between the teeth are released and returned to perfect working order in less than a minute by a three-piece repair kit. Designed for use in cleaning, luggage and tailoring shops, the kit does not damage the fabric while unjamming the fastener. The tools are also used for replacing broken teeth, remeshing teeth and replacing damaged slides.

Army Hushes Generators

Army engineers have developed a silencer box for engine generators that makes them inaudible at distances over 100 yards. It is designed to make detection and spotting of noisemaking military equipment more difficult. The box is aluminum, with a two-inch-thick lining of glass fiber and a one-inch thickness of the same material cemented to the walls of the air-intake and exhaust ducts.

IT'S Sale! MONTH at C & H—WAR SURPLUS

Table Saws, Wheels, Arbors



All steel table saws, 10" high, 1 1/2" thick table is 13 1/4" x 27". Saw comes with 7" combination blade, 6" grinding wheel, double end ball bearing arbor, 1 1/2" shaft & steady rest for grinding. Makes 2 1/2" cut. Will take 10" blade. Included are the nuts & bolts, all holes are drilled and the saw is ready to assemble.

Stock #556. Our Price is only..... **\$9.95**

Table saw. Steel table top 3/4" thick with solid hardwood veneer center, size is 13 1/4" x 27"-10" high. The 7" comb. blade, 6" grinding wheel, double end ball bearing 1 1/2" shaft arbor and steady rest for grinding are included. Saw comes with nuts & bolts, all holes drilled ready to assemble. Will take 10" blade.

Stock #553. Priced for the buyer at..... **\$11.95**

Saws are complete — NOTHING else to buy

EXTRA ACCESSORIES

6" wire wheel.....90c 22" V belt.....75c

1/2 HP heavy duty motor with capacitor.....\$17.50

Saw Blades

Blade of tough steel. Teeth set for slide clearance for wood cuts. High carbon hand filed are 1/2" or 3/4" shaft size.

Work Shop

7" comb.....\$1.35 7" comb.....\$2.50

8" comb.....\$2.00 8" comb.....\$3.00

All blades are postpaid.

DOUBLE END BALL BEARING ARBOR. Half inch shaft 1 1/2" long. Bearing alone worth \$10.00.

Stock #303. Only..... **\$4.95**

ALL BRONZE GEAR PUMP

All bronze corrosion resistant gear pump. Lifts water 26". Delivers 1020 gal. per min. at 1200 RPM.

Develops 110 lbs. pressure or 250' head. Self locking packing nuts.

drain cock, reversible head. Will pump brine, salt water, oil, vinegar, gasoline, etc. Dimensions: 10 1/2" x 7 1/2" x 5 1/2"

Wt. Base holes 13 1/2" x 3". Shaft 1 1/2". 1" x 1" inlet & outlet. Wt., 24 lbs. 31g. by Sherwood Brass Works. All pumps belt driven. All bronze gear pump with 8" V pulley.

PUMP ONLY. Stock #314..... **\$24.00**

Same pump as above, with motor, (electric). Stock #349.

1/2 HP.....\$67.00 1 HP.....\$89.00

3/4 HP.....\$74.00

Same pump with Briggs-Stratton gas engine. Stock #550.

1 1/2 HP.....\$89.50 2 1/2 HP.....\$135.00

3 1/2 HP.....\$165.00 6 HP.....\$195.00

The MORE HP the more PRESSURE.

CENTRIFUGAL PUMP with 2" intake 1 1/2" dia. charge with 6" variable speed pulley. Stock #547..... **\$35.00**

HALES FIRE PUMP

For fire depts., factories, forest fire prevention, etc. 800 gal. per min. Can be operated with a four or six cylinder gas engine, 4 1/2" intake, 2-2" outlets, 250' head at 120 lbs. pressure. Passed by national board of fire underwriters. NEW.

Stock #407. Price..... **\$149.50**

Utility Polisher & Buffer

Fits any 1/4" drill. Polishes, sands and grinds. Sheepskin, 4" rubber disc. Complete. Stock #553.

Imagine it's only..... **\$1.95**

Extra sanding discs \$1.75 a dozen. Add \$2.25 postage for handling.

Chimes or Call System

Navy type. Good for schools, hospitals, offices, homes, etc. 110 Volt AC or DC.

Weather proof. List price \$15.00. **\$1.95**

Stock #552. Super value at only

Add \$2.25 postage for handling.

WESTINGHOUSE

3 phase motors. All models 1/2 HP to 1 1/2 HP. 220 volts. Motors totally enclosed-ball bearing. Stock #541. 40% off list prices.

AIR COMPRESSORS

All ratings from 1/2 HP to 10 HP—new and rebuilt. Write for free details.

HOSE 20' LENGTHS

Gas, oil, or water resistant. Neoprene treated. 1 1/2". Male & female brass connectors. Standard fitting station size. Value **\$7.50**

\$20.00. Stock #528. Our price.....

Foot valve.....\$3.00

PLASTIC TUBING

Good for water, oil, air, electrical installations & radio work. Available in 100 ft. lengths. Min. order 50'.

1/4", 3/16", 1/2" (your choice) 7/16" 4c

per ft. 2c per ft. 4c

5/16", 3/8", 1" 3 ft. lengths 6c

per ft. 3c only. Per ft. 6c

1 1/2" 8c

Stainless Steel Flat Tops

Stainless steel one side, 1 1/2" veneer center, overall 1 1/2" thick. Ideal for shelves, back bar work board, work table, etc. Stock #411

22 x 19 1/2".....\$1.95 22 x 21 1/2".....\$1.95

22 x 24.....\$3.45 22 x 27.....\$3.95

CLUTCH

For Motor-scooters, Motorbikes, Lawn Mowers, etc. Mercury centrifugal clutch for use with any small gas engine. "A" belt pulley, 3/8" & 1/2" bore.

Stock #400..... **\$9.95**

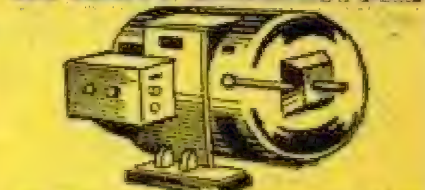
Brand new only.....\$8.00

In lots of 12. Each.....\$8.00

Add \$2.25 postage for handling.

C & H Electric Co.

SPECIAL AC ARMY GENERATORS



300 Watt, 12 volt DC, 2000 RPM. Heavy duty with current cut out relay. High and low switch. 30 amp. meter. Can be bought low shaft and base to be used directly mounted to a Briggs & Stratton 1 HP engine. Tapered shaft engine re-quired. Stock #323. NEW only..... **\$7.00**

Complete with shaft base and bearing. Stock #324..... **\$15.95**

300 Watt, 110-220 volt AC, generator. Mfg. by Electric Specialties Co. Weight 20 lbs. Stock #410..... **\$29.50**

NEW only.....

1000 Watt, 110 volt AC, 60 cycle generator with built in radio filter. Leland ball bearing 1800 RPM. **\$89.50**

Stock #526.....

1500 Watt, same as above. **\$99.50**

Stock #527.....

2500 to 3000 Watt, Leland generator 110 volt 60 cycle. Self excitor, radio filter, junction box for plug in. **\$145.00**

Stock #525. New.....

3000 Watt, Delco. 110 volt DC. Plug in. ball bearing 2800 RPM. List price \$345.00. Used but like new. **\$99.50**

Stock #321.....

Generators are all two bearing.

RUBBER WHEELS

Good for boats, scooters, wheelbarrows, etc. Stock #536.

2"x10", 1 1/2" bore \$ 1.95

2.75 x 10 1/2" & 1 1/2" bore.....\$ 4.50

4.00 x 8 5/8".....\$10.95

10 1/2" x 4, 8 ply 1".....\$ 6.95

13 1/2" x 5, 8 ply 1".....\$10.95

New airplane tires, tubes and wheels with high speed Thicken Hyatt ball bearings. Stock #544..... **\$14.50**

300 x 5, 8 ply 1".....

1700 x 20" 12 ply tubes..... **\$44.50**

Stock #545.....

for earthmovers, trucks, \$300 value.

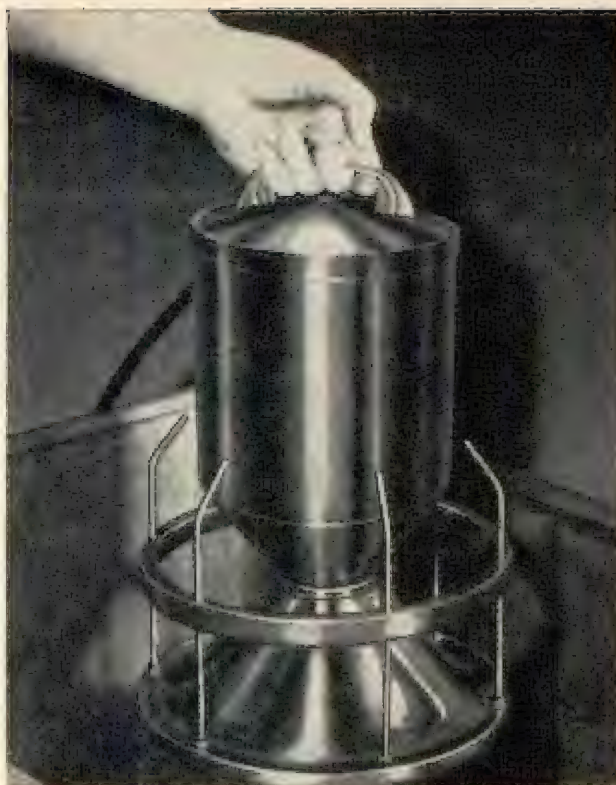
50" 16 ply Bomber-TIRES and TUBES only \$600 value, for tractors, etc. **\$59.50**

Stock #546. Our price.....

AIRPLANE TIRES with landing gear hydraulic strut. Firestone and Goodyear standard tires, 8 ply 27", 20" high. Hydraulic strut is 3 1/2" long, 1 1/2" dia. Can be made into heavy duty **\$22.50** each trailer. Stock #551. Price.....

Sonic Washing Machine

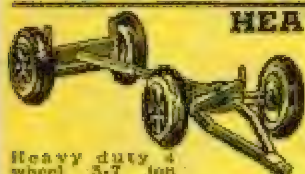
Invented by two Australians, a new washing machine produces sound waves which clean clothing. The cylindrical washer is placed in the center of a tubful of clothes. An electromagnet vibrates a diaphragm, and sound waves produced by the diaphragm cause tiny waves in the water. The clothes and water oscillate about 100 times a second. The vibration shakes loose the dirt particles and holds them in suspension. One batch of clothing can be washed in less than five minutes.



Putting Pecan Shells to Work

Only a few years ago, one Texas businessman's biggest problem was disposing of 10 tons of pecan shells a day. The shells were a waste product of his pecan-shelling plant. Today, he spends his time looking for more shells because he converts them into toiletries, mechanics' soaps, plastics and even some types of explosives.

& OTHER ITEMS at LOWEST PRICES Sale!



HEAVY DUTY FARM WAGON

Heavy duty 4 wheel 3-7 ton trailer. 27" high, rack size is adjustable 12 to 20 feet. Built of heavy 8" I beam channel iron and a 3" dia. seamless tube. Double bronze king pins, heavy duty hitch, double high speed Timken bearings. Width of track is 8". This trailer will not whip & has been tested at speeds up to 50 MPH. Use it for chopper wagon, boat trailer, machine mover, logging, construction work. Trailer comes with 4 wheels and spare tire. All tires are airplane type and are GUARANTEED. Value is approx. \$500. Stock #558. OUR PRICE IS ONLY. **\$179.50**

HALF TON WAGON



Half ton wagon with plate sheet. 24" x 42", 8" x 1" steel axle. Stock #332. Write for details.

4 Wheel Army Bomb Trailer

Costs less than price of tires. Can be used for compressors, const., work, light plants, foundries, machinery, etc. Wgt. 375. Goodrich & Firestone 8 x 9 tires 21" high. Trailer is 6' long. Axle size 1 3/4". Cone ball bearing race. 1" center channel 36" wide. Pay load 1 ton, will take a ton. 36" tongue. Zerk fittings. Tires list at \$26.00 each. Stock #559. **\$90.00** Our price for complete trailer is...

HORNS and HOWLERS



Motor driven (not a vibrator). Heavy duty with great power and long life. Adjustable for high, medium or low tone. 100 volt AC current. Weather proof. For alarm or signal here on boats, school yards, factories, etc. List price \$47.00. NEW Stock #302. OUR price.... **\$9.45**



Electric Rubber Cable (all new) CORD SETS

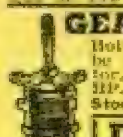
Extension cords 100 ft. Heavy duty. Plug, socket, and guard. No. 16 wire. Worth at least \$10.00. Stock #310. Our price... **\$3.95** Same as above 50' lengths... **\$3.95**

HEAVY DUTY ELECTRIC CABLE

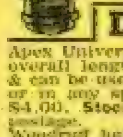
3 wire #10 rubber cable. Stock #351. **\$13.00** 65' with lugs. Value \$26.00. Our price **\$125.00** 3 wire #10 government submarine type. Use underground, underwater, overhead. Cost U. S. 90c ft. Stock #542. OUR PRICE 100 ft. **\$24.00** 500 ft. **\$100.00** 250 ft. **\$55.00** 2900 ft. reel **\$530.00** 2 conductor rubber cable #4-stranded-75 ft. length with connectors. Stock #543. **\$80.00** List price \$177.00. Our price... **\$35.00** 4 wire #6 stranded heavy duty. List price \$2.30 per ft. Stock #547. OUR PRICE 50 ft. **\$30.00** 100 ft. **\$55.00** 250 ft. **\$125.00** 500 ft. **\$225.00** 1000 ft. **\$400.00** 225 ft. lengths 3 wire #10 rubber cable. Two male connectors. Value \$100.50. **\$35.00** Stock #554. Price...

Electro-Lift HOIST

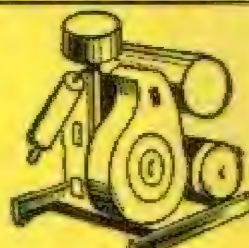
500 lb. Electro-Lift Hoist. 17 ft. of cable-up and down button and trolley. 3 phase. 220 or 440 volt. 60 cycle. Used in A-1 shops. List price \$185.00. Stock #560. Specify **\$75.00** 220 or 440 volt. Our price...



GEAR HEAD MOTOR 1/20 HP Boltzer Cabot 110 volt AC 60 cycle. Can be used for turn tables, television agitator, telescope drives, etc. Approx. 1/20 HP. Output shaft-50 RPM. **\$14.95** Stock #406. New only...



HEADLINE FLASH Apex Universal Joint 1 1/2" female socket, 1 1/2" stud, overall length 5 1/2". Will fit any 1 1/2" shaft motor & can be used as an agitator for milk, paint, pump or in any spot that needs a universal joint. List \$4.00. Stock #562. Our price 95c plus 10c for postage. Woodruff keys in assorted package of 50. 5/16", 3/16", 7/32", 9/16", 8/16" sizes. Now only \$1.50 per package. Add 25c for postage. Stock #563.



AC ARMY LIGHT PLANTS

300 watt, 110-220 volt AC, 60 cycle light plant powered by 1 HP gas engine, direct drive. Mounted base weight 40#. Stock #400. **\$89.50** 500 watt, 110 volt AC, 60 cycle. (than direct connected. Stock #414. **\$149.50** New 1000 watt, 110 volt 60 cycle AC plant with Briggs & Stratton directly coupled to a Leland generator. Stock #351. **\$189.50** New 1500 watt, 110 & 220 volt 60 cycle, AC plant with Briggs & Stratton directly coupled to a master generator. Stock #352. **\$209.50** 2500 watt, 110 volt AC 60 cycle with Briggs & Stratton Model 2 and Leland generator. Stock #317. Used but like new **\$225.00** Add \$10.00 for tools and spare parts. 5000 watt, 110 volt AC, 60 cycle with automatic remote control. Powered by 4 cyl. Jeep gas engine. Used but like new. **\$595.00** Stock #318. 7500 watt, 110 volt AC, 60 cycle powered by a VE 4 Waukena 4 cyl. gas engine. Continental or Hollinsworth generator. Remote control starting. Complete with switchboard. **\$675.00** Used but like new. Stock #347. Add \$85.00 for transformer to make this plant 3 phase 220 volts. 10,000 watt, 110-220 volt AC, 60 cycle. Remote control. Powered by a Jeep 4 cyl. gas engine. Used but like new. **\$800.00** Stock #319. New job original crate, only **\$1100.00** 25,000 watt, 220 volt AC, 3 phase. Spare parts. Now packed for export. **\$2150.00** Stock #415.

Lineman's Pliers

High quality Knutler side cutting pliers. Stock #561. 6 1/2" 8" 7" diagonal cutler \$1.50 \$2.10 \$1.85 new new new

Over 4,000 items in Stock. Write for Circular

ALL ITEMS GUARANTEED AS REPRESENTED C & H ELECTRIC Co. 424 W. JUNEAU AVE. MILWAUKEE 3, WISCONSIN All prices F.O.B. Milwaukee; 25% deposit required on all C.O.D. orders. No C.O.D.'s under \$10.00. Use stock number when ordering. Many other bargain items not listed—write for our free circulars.



Now everyone can afford a new top quality Radiant glass-beaded projection screen!

If you have been putting up with a makeshift, discolored, or worn-out screen—here's good news! Now you can get a new Deluxe "CHAMPION" Radiant screen with more new features, more improvements, more real quality than ever before . . . for as low as \$15.00.

Enjoy brighter, more contrasty pictures every time! Radiant's "Million Mirror" screen fabric has millions of tiny glass beads embedded in the pure white surface . . . millions of tiny mirrors that reflect all the crisp detail of black-and-whites, all the warm, glorious beauty of color pictures.

MAKE THIS FREE "SCREEN TEST." Prove in your own home how much more brilliant all of your pictures appear on the new "Radiant Million Mirror" screen. Send for FREE sample swatch of Radiant screen fabric today!

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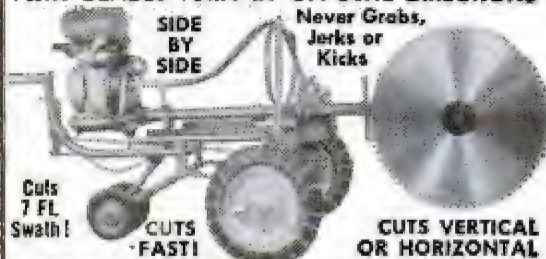
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WORLD'S GREATEST SAW INVENTION

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Stop paying taxes on idle brush and timberland. Turn it into pasture or crop land quickly, easily and at low cost. The greatest brush and timber clearing saw invention in America. No other saw ever built can equal its operating advantages and features. Self-propelled by hydraulic oil transmission. Saw in horizontal position swings to cut 7 ft. swath. **DEALERS: WRITE FOR TERRITORY!**

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Have fun. Save money on home repairs. Operate profitable part-time business. Get heavy-duty Emrick Lathe, Drill Press, Saw Arbor, Grinder, Sander—all in ONE machine, using ONE motor. Equals in performance equipment costing \$200 or more. Direct Factory Price only \$39.95 cash, or on Easy Payments. 10-Day FREE Trial. **MONEY-BACK GUARANTEE.** Thousands of satisfied users. Our 51st year. Write today for FREE Catalog, and learn about our Big 15-Day Pre-Christmas Sale.

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HOT-START COIL



\$11.95
Postpaid
or C.O.D.
plus charges

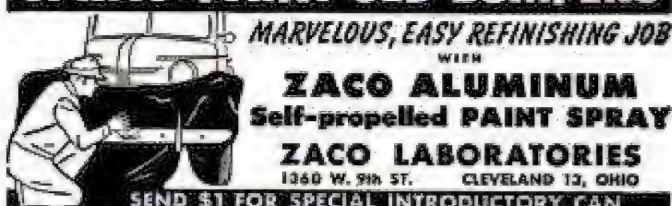
GIVES YOUR CAR THE EXTRA SPARK THAT ASSURES A POSITIVE START

Here is the new Hot-Start Coil that gives you a hotter spark for starting. Overcomes normal voltage drop from starter. Easy to install, fits all cars specify make and model. Order today.

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Surplus items—hundreds of them for home, shop, factory, farm and outdoor use. New items, used items, reconditioned items—all at tremendous savings—all priced for quick sale.

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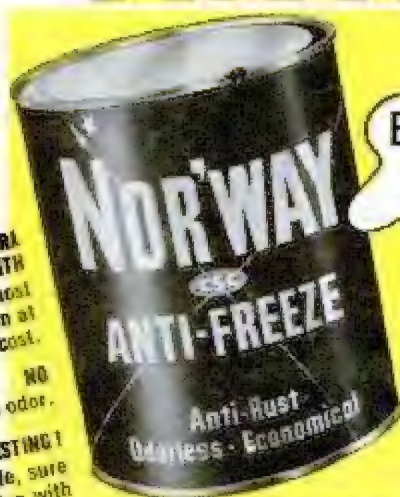
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EXTRA STRENGTH gives the most protection at the lowest cost.

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Safe, sure protection with only an occasional check-up.

PREVENTS CORROSION of all cooling system metals!

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WILL NOT BOIL AWAY! Guaranteed protection for a full winter driving season.

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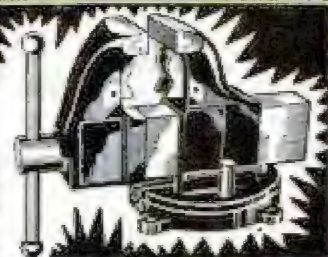
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Ideal for plumbers, garages, machinists, manufacturers, etc., for heavy duty use. ORDER TODAY. LIMITED SUPPLY. SEND ONLY \$39.95 and we pay freight in U.S., or send \$10 deposit, pay balance C.O.D. plus freight.

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Satisfaction
Guaranteed or Money Back

- 2" capacity
- Cuts to center of 48" circle
- Cuts 1/4" Steel—Brass—Aluminum
- Cuts 1" wood freely
- 10" x 10" Precision Ground Grey Iron Table Tilts to 45°



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Most terrific value ever!
Electr-O-Tool now comes in a smart, jade-green plastic chest that lasts a lifetime! And at *no increase in price!* Full assortment of most popular accessories! Genuine Casco Power-Head! Fractional HP, AC-DC motor. On-off switch. Unbreakable plastic Tenite case. Special safety-sleeve. Non-slip chuck. (Free 36-page Project Book with every Kit!)

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For Wood, Metal,
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CASCO

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New To Sharpen Carbide Tip Tools, All Types of Cutters and Circular Saws A PRECISION FIXTURE Only **\$29.95**

This all-purpose sharpening fixture is the only one of its kind. Easiest, simplest, fastest sharpening method available. Assures cleaner cuts. Save money and make money by sharpening tools, cutters and saws for yourself and others. Precision built at surprisingly low prices. Send check or money order... money-back guarantee... nothing to lose... shipped prepaid.



Model 135 only **\$29.95** for 1½" to 12" diameter saws and cutters. Table tilts either side almost to 80°.
Model 180 only **\$49.50** for 1½" to 16" diameter saws and cutters. Table tilts either side over 30°.
Model 280 only **\$11.95** for 7" to 8" diameter saws.
Model 100 only **\$14.95** for 7" to 10" diameter saws.
Model 120 only **\$16.95** for 7" to 12" diameter saws.
Model 130 only **\$23.50** for 2" to 12" diameter saws.
Dust Proof Ball Bearing Grinding Wheel Stand with 23" "V" Belt **\$14.95**.
2 grinding wheels **\$5.00** extra.

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New LOW-COST, TOP-QUALITY ¼" Electric Drill

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Powerful, Lightweight

This new ¼" drill is "tops" in construction and performance. Drills wood, metal, plastics, etc. Gleaming, chrome-steel finish! Die-cast handle and case! Pistol grip! Trigger switch. An unbeatable buy at this price. Factory guarantee.

AC/DC MOTOR
¼" in steel
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J. HOUSTON MAUPIN, Dept. 55, Tipp City, Ohio

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Finest low-cost tractor. Costs too little to do without. Engines burn gasoline or kerosene. Starter and lights available. Other larger Models to choose from. Over 4,000 in world-wide use. Time-proved and tested. At low cost they easily mow, plow, disc, harrow, plant, cultivate, etc. Sold only direct to user. Write for FREE details.

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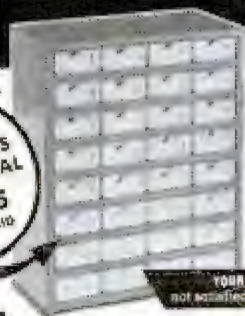
AMAZING ELECTRIC MAGIC MOTOR

Drives toys from ordinary flashlight batteries. Have fun with this real, powerful electric motor. Easily assembled with your own hands, without tools, screws, bolts, nails or glue. Made of plastic and metal parts. Any child can build it. Drives most any free running toy. No transformer or house current needed. Complete with full instructions. **\$1.25** postpaid. Money Back Guarantee.

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GET YOURSELF A
HANDI-CHEST
FOR AS LITTLE AS
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POSTPAID

32
DRAWERS
ALL METAL
\$8.95
POSTPAID



DRAWERS
Uniform in all cases
... 11 1/2" deep, 2 1/2"
wide, 1 1/2" high. 19 drawers
completely divided to
make 32 drawers. Metal
pull tabs. Metal
pull tabs.

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Model 16K HANDI-CHEST, same size as above, with heavy Kraft-board drawers, metal pull tabs, complete **3.95**

32 drawers Steel Cabinet is 6" deep, 15 1/4" high, 12 1/2" wide. 96 compartments in aluminum drawers. Model 32A HANDI-CHEST complete **8.95**

Model 32K HANDI-CHEST, identical in size, with heavy Kraft-board drawers, metal pull tabs, complete **5.95**

64 drawers Steel Cabinet is 6" deep, 15 1/4" high, 24 1/2" wide. 192 compartments, aluminum drawers. Model 64A HANDI-CHEST complete **15.95**

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IDEAL FARMERS, SPORTSMEN, CONTRACTORS
110-volt, 60-cycle, 3000 watt. Remote switch,
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New condition. Cost Gov't. \$756.00. This
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Also lower price plants (Write for details).

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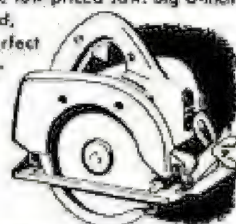
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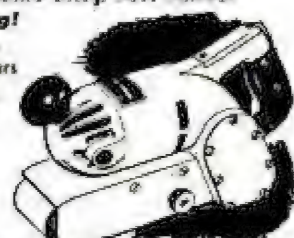
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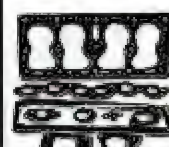
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ASSEMBLY
Heavy Duty
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GPW8005A
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Also inter-
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with Civilian
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640146



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GPW6710

12c
VALVE
REGROUND
GASKET SET
A1537-
GPW18387
75c



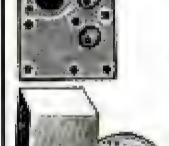
CARBUR-
RETOR
REPAIR
KIT
A6940-
GPW-
18357B

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A1534-
GPW6050
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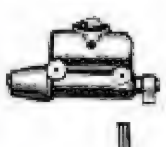
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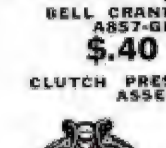
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Auto Lite
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Type) \$18.50
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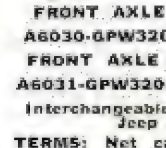
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A857-GPW3171
2 RE-
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ASSEMBLY
638992-
GPW7583
Outright

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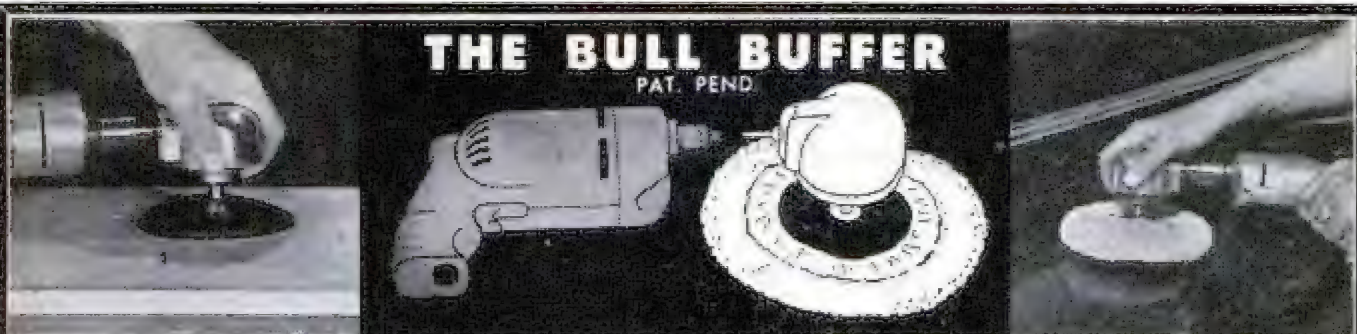
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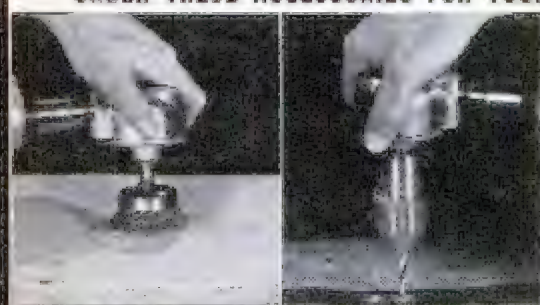
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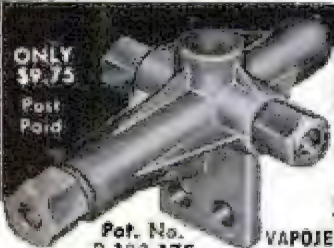
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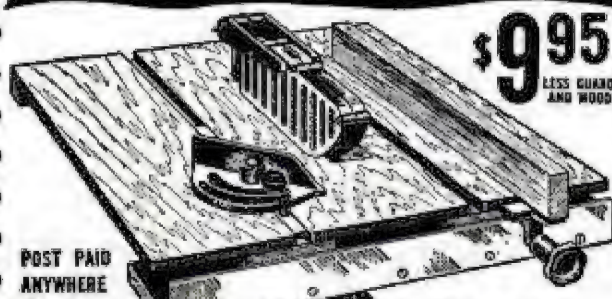
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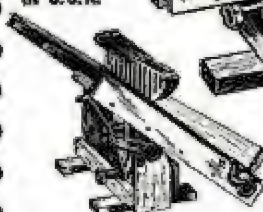
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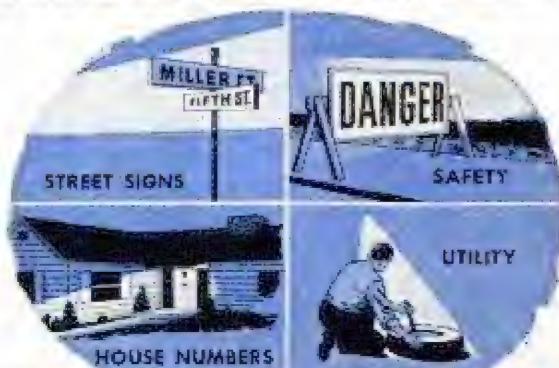
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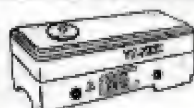
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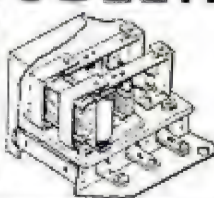
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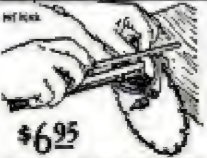
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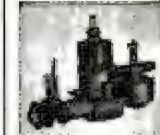


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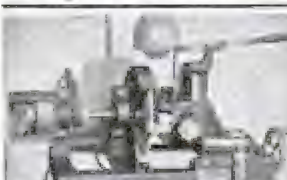


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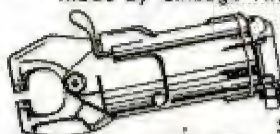
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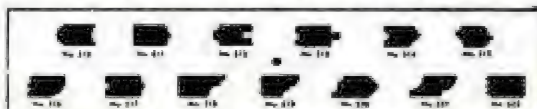


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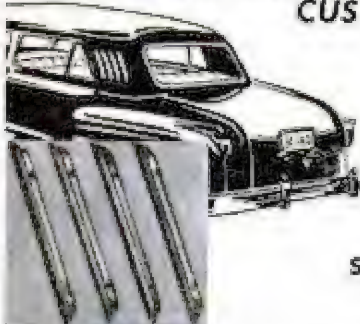


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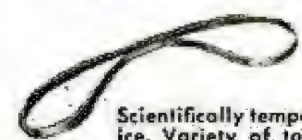
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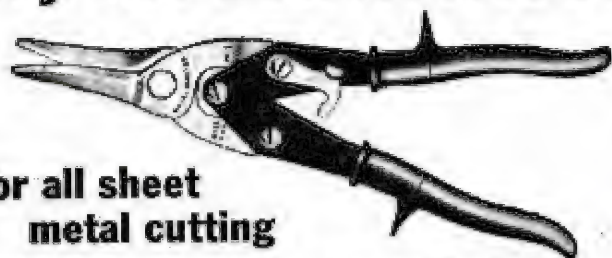
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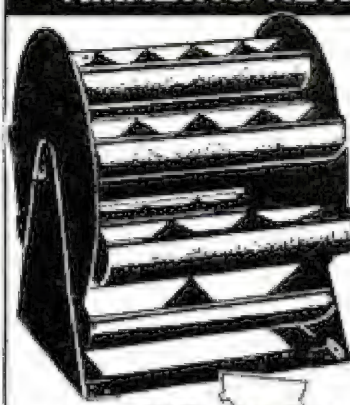
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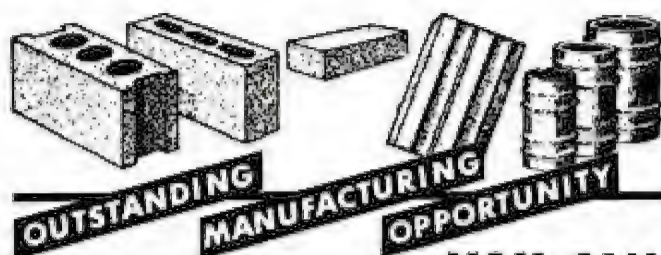
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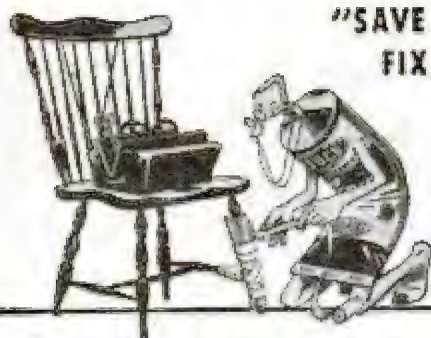
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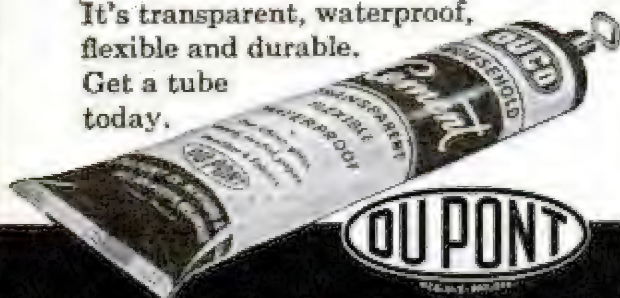


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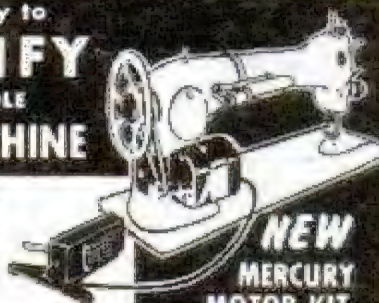
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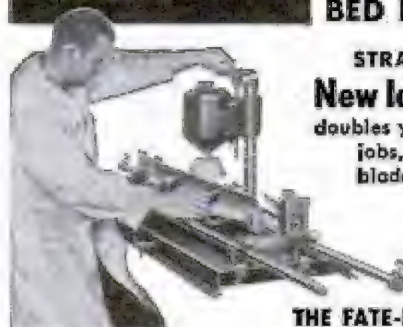
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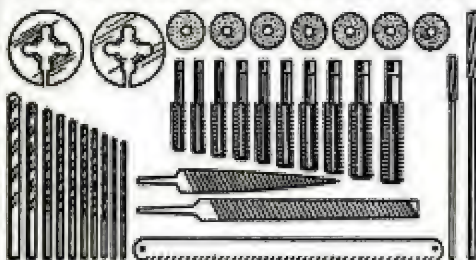
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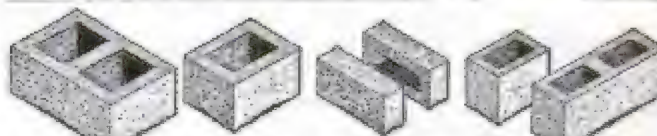
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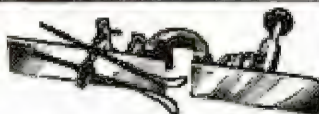
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You can convert any standard make drill press into your most versatile, useful, low cost workshop tool. Barron Precision Tools now enable you to perform 15 indispensable shop operations—surface-plane woods and plastics—rabbet—tenon—panel—bead—groove—bevel—mortise—route—cut dovetail—sand surfaces and contours—shape—cut moldings—grind and buff. Over 200,000 Barron Tool users. Every tool sold on full 10 day money back guarantee.

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BARRON TOOL COMPANY, INC.
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FREE
Workshop
Guide &
Catalog

PISTON TYPE COMPRESSOR



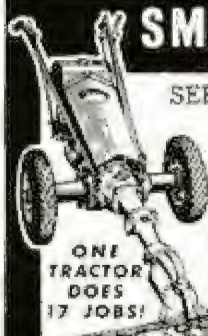
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Paints walls, ceilings, screens, furniture and machinery faster, better. All complete as shown less motor. Carry anywhere. Fully guaranteed. Could be used with 1/4 H.P. motor or less. Price \$35.00 less motor F.O.B. Chicago. \$5.00 deposit balance C.O.D. or see your dealer. With motor \$55.00.

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Build your own ALL ALUMINUM 12 cu. ft. FREEZER CABINET. 75 sq. ft.—3 sheets 30 in. x 10 ft. of embossed aluminum, beautiful pattern, heavy gage, high thermal reflectivity—for outside shell and inside food liner—\$37.50. Premarked for cutting and bending. Due to low cost this offer, enclose \$1.00 (will be credited if purchase is made) for complete information, including drawings, compressor performance data F-12 and F-22 to use in unit selection, technical design data, and information on liquidated compressors and parts at 1/3 to 1/2 off. Data and design by recognized authorities. Freezer, Dept. A, Box 1191, Cincinnati, O.

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3" diam. \$2.95

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1000 NEEDLESS STEPS!**

SAHARA Will Remove Without Water
Paint, Tar, Grease, Grime, Pipe Compound,
Printer's Ink, Linoleum Paste, Pitch, etc.

Send for TWO 50¢ TUBES POSTPAID

AVAILABLE IN TUBES, ONE POUNDED CONTAINERS, AND PAILS. AGENTS WANTED
Sahara Waterless Soap Co. — Grand Rapids, 2 Mich.



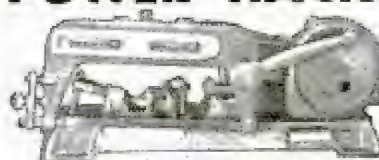
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have served Toolmakers and Machinists for 43 years. Better, finer chests shown in free catalog.

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POWER HACKSAW \$47.25



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F. O. B. Benton Harbor

• Rugged cast iron construction. Wt. 56 lbs. bronze bearings. Draw cut. Auto. return lift. Auto. shut-off. Vise swivels 45°. Cap. 4" x 4".

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THE CHALLENGER MINIATURE RACING CAR



POWERED BY PRECISION
DIESEL ENGINE
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EXTRA \$22.50
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BY MAIL**

"Wellworth" Sensational Offer! Reg. \$60.50 WESTINGHOUSE AIR COMPRESSOR

2-CYLINDER PISTON TYPE

Operates with 1/2 H.P. Motor or equivalent gas engine.

Complete outfit consisting of compressor, pressure tank, air gauge, air chuck, 20-ft. hose, pop valve, copper tubing with 4 brass flared fittings for connecting compressor to tank, 4-way cross and 3 nipples. Complete outfit of 7 items.....**ONLY**

COMPRESSOR SEPARATELY.....**\$21.50**

IDEAL for HOME • FARM • FACTORY
Wherever Compressed Air is Needed

For spraying paints, insecticides, etc.; inflating tires, operating air tools and many more uses. Automatic clutch makes it suitable for mounting and operating from trucks, tractors, etc. Instructions furnished. A fortunate purchase from the government enables us to offer you this amazing buy. All brand new equipment. Replacement parts available.

This low price is but a fraction of the price of manufacturer and of leading mail order houses.

\$29.95
SHIPPING WT. 40 LBS.

Equipment less compressor....**\$10.50** WT. 15 lbs.

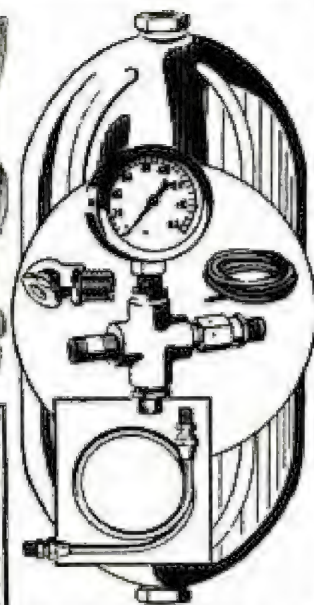
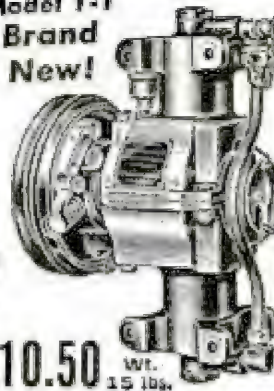
THE COMPRESSOR

Piston Type, 2-cylinder, 2 inch bore, 1 1/4" Stroke Ball Bearing. 3.27 C.F.M. at 600 R.P.M. Capacity up to 6.54 C.F.M. Suggested operating pressure 75 P.S.I. DIMENSIONS: 8" wide, 11 1/8" high, 8 3/4" deep. Wt. 26 lbs.

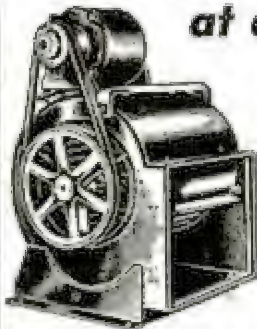
TANK AND ACCESSORIES

6" x 24" stainless steel tank suitable for 150 lb. pressure. Two 1/4" openings. Air gauge, pop valve, air chuck, 20 ft. hose, Copper tubing and fittings as shown. Wt. 15 lbs.

Model T-1
Brand
New!



"Wellworth" BLOWER at a Bargain Price



Quiet operating. Double wheel inlet, double width blower. For heating, ventilating, cooling, air washing, exhausting and forced draft.

DIMENSIONS: 10" wheel; outlet 13 1/2" x 11 1/2"; inlet 8 3/4". Height 19". Width 18". Depth 16 1/2". C.F.M. 1/4" S.P. 1600; outlet vel. 1575; motor 1/4 H.P. with overload relay; cord & plug, 110 v. 60 cy. AC. Ship. Wt. 67 lbs. **\$39.50**
Special price...

"Wellworth" External Atomizing SPRAY GUN

Flat and round spray, quart cup. Requires 2 c.f.m. at 35 to 40 lbs. pressure. Ideal for spraying lacquer, synthetic enamel, lead paint, etc.

Spray gun with 20 ft. hose **\$12.95** and fittings. Wt. 7 lbs...

Spray gun only; **\$10.00**
wt. 5 lbs.....



140 CFM "WELLWORTH" BLOWER



Single-inlet blower that gives top performance on heating, ventilating, exhausting, cooling, drying and similar applications. 5 1/2" x 4" mounting flange with 2 1/2" square discharge. 3 1/2" dia. blower wheel powered by direct-connected 1/15 H.P., 110V., 60C., A.C. motor with conduit box and 20' leads. 7 1/2" wide less flange by 7 1/4" H. x 8 3/4" D. Suited for hundreds of new and replacement uses. Shpg. wt. 8 lbs. **\$16.50**

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USED, GUARANTEED LIKE NEW.



CHICAGO PNEUMATIC RIVETER & CHIPPING HAMMER

CP4X Pistol grip handle. Takes up to 3/16" rivet. Weight 6 lbs. List price \$75.00.

SPECIAL PRICE..... **\$10.95**

Same as above, brand new..... **\$22.50**

Size CP3. Takes 5/32" Rivet..... **\$8.95**

Chicago Pneumatic Lever Type AIR DRILL



With 1/4" Jacob Chuck. Wt. 3 lbs. List price **\$14.95** \$35.00. Only.....



Ingersoll Rand AIR DRILL

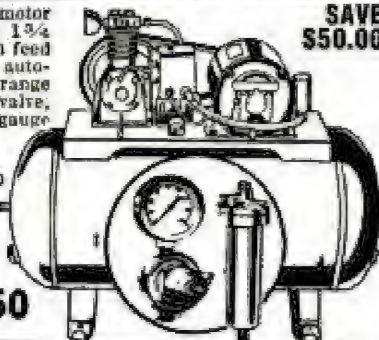
With 1/4" Jacob Chuck. Wt. 2 lbs. List price **\$14.95** \$55.00. Only.....

AUTOMATIC COMPRESSOR UNIT

1/3 H.P. heavy duty capacitor motor AC 110/220 volt 60 cycle, 2 x 1 3/4 inch piston type compressor, splash feed lubrication, 12 x 24 inch tank, automatic pressure switch, pressure range 100 to 125 lbs., CFM 2.2, check valve, safety valve, air regulator with gauge and filter, 20 ft. air hose with air chuck for inflating tires. V. belt drive. Shipping wt. 90 lbs.

Special Price **\$79.50**

Same unit as above with 1/2 H.P. motor, furnished with 13" x 24" tank. CFM 2.8 at 125 lb. pressure. Shipping wt. 125 lbs. **\$98.50**



SAVE \$50.00

300 GAL. COOLANT PUMP

A HEAVY-DUTY PUMP AT 40% LESS

You pay less and get a larger, higher pressure, higher capacity, heavy duty coolant-type, recirculating pump. Also extensively used on evaporative coolers. Will deliver 60 gal. per hr. at 8 ft. head and 300 GPH at no head. Heavy duty 1/30 H.P. totally enclosed, 110V., 60C. motor with long life oiling. Noncorrosive shaft and pump. 10 1/2" high, 3/4" I.P.T. Ship. wt. 12 lbs. **\$19.50**



AUTOMATIC PRESSURE SWITCH WITH UNLOADER

Double pole, with 2 way release valve. Set at 125 to 150 lbs. pressure. Wt. 4 lbs. **\$10.25**

Same without unloader..... **\$7.50**
Switch—20 to 40 lb. adjustable to 80 lbs. For air or water **\$5.50**

"Wellworth" Check Valves



Dash pot type Quiet operating 1/4" valve **\$2.75**
1/2" valve **\$4.50**



"Wellworth" 1/4" REDUCING VALVE & GAUGE

Oil resistant, pressure 0-to-200 lb. Reduced pressure 0-to-75 lb.; 3 outlets 1/4". Wt. 2 lbs. **\$5.75**



Reduced Price **Only \$14.50**

6 FT. STOW FLEXIBLE SHAFT

Heavy Duty, 3/8" Core. Best piano wire. Ball bearing handle and arbor, rubber covered housing; for 1/2" motor shaft; for 1/2" bore wheels. Operates on 1/4 H.P. Motor at 1725 or 3450 R.P.M. \$29.00 Value, **\$14.50**. Wt. 8 lbs.

1/30 H. P. MOTOR BARGAIN

12 volt D.C. motor, 2450 R.P.M. 2.0 amps, 1/4" shaft. Size overall 3" x 4". Weight 3 lbs. USE AS 6 VOLT GENERATOR. **\$2.75** ea.

QUANTITY PRICES

4 for...\$7.50 24 for...\$36.00 100 for...\$135.00

Prices f.o.b. Chicago. Immediate delivery. All items sold on money back guarantee. Send check or money order today. Catalog FREE.

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GADGETEERS! HERE ARE THOSE TERRIFIC MIX VALUES



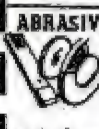
GADGET MIX Especially prepared for the HOBBYIST. Rivets, Spacers, Bolts, Screws, Gears, Etc. A Gold Mine. #106. 5 lbs. **\$1.19**



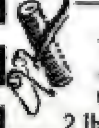
BEARING MIX #170A A PALLEY SPECIAL!! Approx. 20 Needle, Ball & Roller Bearings, New & Used - Sizes 1/2" to 4". Some of these cost Gov't \$10 apiece. Never such a value! **\$1.59** 5 lbs. . . ONLY



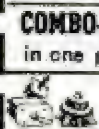
HINGE MIX #170H. 12 pairs of strap & butt hinges. Sizes 1" x 1" to 1 3/4" x 4" in length to 8" strap. A \$3.00 VALUE for ONLY **\$1.09**



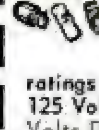
ABRASIVE AND GRINDING WHEEL MIX 50 Pieces including honing stone, pencil rolls, wheels, Abrasive sheets, etc. A sharp value. #170AG **99c**



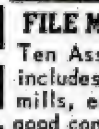
SPRING MIX #206 Torsion, Compression & Tension Springs, asstd. sizes. A treasure trove for emergencies. 2 lbs. for ONLY . . . **89c**



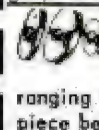
COMBO-MIX Comb. of all above in one pkg. Special deal. **\$5.59**



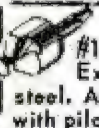
SWITCH MIX #SM-1 12 assorted types of Aircraft Switches, including double & single throws, double & single poles & multiples. Voltage ratings from 5 to 20 amps, 125 Volts A.C., 35 amps, 24 Volts D.C. 1001 Uses . . . **\$2.95**



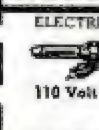
FILE MIX Ten Assorted Files of 6", 8", 10", 12", includes 3 Vixens, half rounds, bastards, mills, etc. in seconds and used but in good condition. 1 Vixen alone worth our price for entire mix. #F-1 **99c**



PULLEY MIX #PM-1 You'll want this one around. 10 micarta and metal pulleys ranging from 1" to 5" with ball and one piece bearings. These are aircraft pulleys, the best made, with 100's of uses. A WONDERFUL BUY @ **\$2.95**



COUNTERSINK MIX #168 - Countersink Assortment. Excellent condition. High speed steel. Assortment of ten 100° and 110° with pilot sizes ranging from 3/32" to 3/16". #CM-1 **\$2.69**



ELECTRIC SOLDERING IRON 110 Volt A. C. ESSICO 75 Watt **\$1.69**

PALLEY SUPPLY COMPANY
6321 SAN FERNANDO RD.
DEPT. RM.10 GLENDALE 1, CALIF

SAVE UP TO 85% IN WAR SURPLUS



WHEELS For Wagons, Dollys, Handtrucks, Wheelbarrows, etc. 10" dia., with 7/16" center hole. (can be drilled out to take 5/8" axle) Wheel is 1/8" steel with 10 x 1.75 heavy duty, semi-pneumatic cushioned rubber tire. **\$1.75**



PALLEY OCTOBER BARGAINS
PEXTO PLIERS Side cutting beveled head a \$3.50 value. **\$1.79**



RAWHIDE MALLET For working light metals, wood or plastic. Head dia. 1 1/4" x 4" **\$1.09**



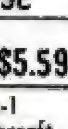
15" MONKEY WRENCH Adjustable 4" Jaw opening Drop forge Auto type. Cad. Plated . . **89c** Black **79c**



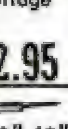
METAL SNIPS Hard steel blades. Compound action. Expansion spring. Lock device. R. & Left Hand . . **\$2.59**



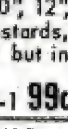
OXYGEN & ACETYLENE REGULATORS
OXYGEN REGULATOR - Bottle Press. Gauge - 0-3000 PSI. Regulating Press. Gauge - 0-400 PSI
ACETYLENE REGULATOR - Bottle Press. Gauge - 0-500 PSI. Regulating Pressure Gauge - 0-50 PSI.
AIRCO & Other Popular Makes to fit ALL Standard Bottles - ALL NEW!! **\$12.95**
A Real Buy at **\$25.00**
or Both for



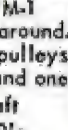
High Pressure Oxygen Bottle New. Will hold up to 3,000 PSI, with Co2 used as tire inflator or fire extinguisher, with oxygen for sick room or deepwater diving, etc. Completely equipped with brass valve, 36" hose, Dial gauge, & canvas bag. **\$2.29**



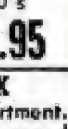
NEW PRESSURE TANKS Stainless steel - Shatterproof. Rustless. 10,000 available in 6 different sizes. 1001 Uses.



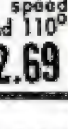
G-1... 12 1/2 x 24 inches - 2100 Cu. In. capacity 29 Cu. Ft. **\$4.75**
D-2... 6 1/2 x 24 in. 500 Cu. In. capacity 7 Cu. Ft. Corrosion resistant steel. **2.49**
D-2... Stainless Steel **3.49**



F-2... 6 x 45 in. 1000 Cu. In. capacity 14 Cu. Ft. **3.95**
A-4... 5 x 8 in. - 104 Cu. In. capacity **1.35**



PIANO HINGE
Ideal for painting, cooking, spraying, ocean buoys, underwater fishing, or diving.



SASH BRUSH - Handy for cleaning parts in home & Mach. shop. **27c**



REAMER MIX
168 - Reamer Assortment: Special Taper line finish Reamers - High Speed Steel. Slightly used but in excellent condition. Ten assorted sizes ranging from .168 x .165 and .244 x .215 to .425 x .385 and .432 x .403. One alone worth our selling price of ten. For set of ten Reamers. **\$4.49**



AIRCRAFT CABLE
Alloyed steel, rust resistant. 3/16" ea. 18 ft. long, with turnbuckle ends. **99c ea.**
Preformed 1 x 19 strand - on reels
In any length
1 1/16" 3 1/2 ft. 1/4" 8 1/2 ft.
3/32" 4 1/2 ft. 9/32" 9 1/2 ft.
1/8" 4 1/2 ft. 3/8" 12 1/2 ft.
5/32" 5 1/2 ft. 1/2" 15 1/2 ft.
3/16" 6 1/2 ft. 1/4" Bronze 10 1/2 ft.

PNEUMATIC AND AIR TOOLS
10,000 in various popular makes, sizes, types, Cleco, Aro, Ingersoll Rand, Chicago, Pneumatic, Buckeye, etc.

RIVET GUNS Pistol & Gooseneck Type **\$1.81** PISTOL

101 Uses, Chipping, Riveting, Hammering, Breaking cement. Auto body work. Chicago Pneumatic, Cleco, Ingersoll-Rand Makes, E3, E2, 3X, 2X, 0X.

S\$S VALUE \$8.95 #180 Gooseneck \$80 Value **\$15.95** #186 Squeezer PNEUMATIC ALLIGATOR SQUEEZER

AIR DRILLS OR MOTOR SPECIAL with 1/2" Jacobs Chuck **\$15.00**

THOR #210R Model 4526 2300 RPM REVERSIBLE AIR DRILL Excellent for Tapping. **\$19.95**

\$12.50 PNEUMATIC ANGLE DRILL each With Terry Adapter Send for Catalog and List of Other Sizes, Types of Pneumatic Tools.

NAVY Sealed Beam LAMP
US Navy Portable Pistol Grip, Sealed Beam, Search, Spot or Emergency Lite. 12 volt. Light weight. Ideal for Auto, Boat, Trailer, Farm, etc. Cost Gov't \$35. OUR PRICE **\$2.95**
Set of 3 extra filters, Red, Grn, Amber **99c**

ADJUSTABLE TAP WRENCHES
Jaws are made of tool steel, hardened & tempered. Won't break or get out of line.
#7 Threadwell Cap. 1/4" to 1 1/8" Length 19" @ **\$2.49**
#8 Vermont Cap. 3/4" to 1 5/8" Length 40" @ **\$3.49**
#24 Greenfield Cap. 1 3/4" to 4" Length 72" @ **\$6.49**

OXFORD BRG & TOOL SCRAPERS
Complete set of 8 Tools packed in Grained Wood Case. Contains 1 ea. 8", 10", 12", 14" half round scraper. 1-6" Three square Scraper. 1-12" Double end Scraper. Made of Finest Tool Steel. Forged, Tempered, and Hollow Ground. An Unheard of Price! **\$2.49**

THE LARGEST FIRM OF ITS TYPE IN THE WORLD

ORDER BY MAIL from "GADGETEERS HEAVEN"

ALL ENGINES READY TO RUN.



New Hydraulic Cylinders, Valves, Pumps, Fittings, Hose and Tanks
51 SIZES AND TYPES. WORLD'S LARGEST SUPPLY. 1001 Labor Saving Adaptations for Pulling, Pushing, Lifting Operations. Finest Precision workmanship and materials. Liquid and/or Air Operation.
 20,000 Available. Write for Catalog. Priced to sell at 15% Gov't Cost.



Hydraulic PUMPS

MP-5 - For operating hydraulic system on tractors, trucks, construction & industrial machinery, etc. Delivers 8 GPH at 1200 RPM at 1000 PSI on 5 HP. . . . 3/8" and 1/2" threaded standard pipe ports - 3/4" keyed shaft for pulley or gear drive - 4 mounting holes. 7" L x 5 1/2" W x 5 1/2" H - Used but guaranteed condition. Originally cost over \$100 ... Now Only **\$17.50**



P-1 PESCTYPE - Positive displacement gear type. Capacity: 1 gal. per minute, at 1500 RPM at 1500 PSI. Operating speed: 3700 RPM intermittent max. 4500 RPM. Rotation: either direction with slight adjustments. **\$9.49**



ROME C FUEL PUMP

800 GPH at 30 PSF, can also be used as hydraulic for 4 GPM at 400 PSF or for Vacuum drawing 15" mercury at 1500 RPM. **\$6.29**



VALUABLE GEAR BARGAINS!

#112 8 to 1 ratio, spindle drive
 #110 \$2.98
 6 to 1 with screw shaft
 #111 \$4.98
 #112 85 to 1 (can be used for radio, antennae, etc.) . #112 . . \$3.95
 #G-11 - 10-1 gear ratio \$3.95



D. C. GENERATORS

Suitable for adaption to home welding units, portable and rural lighting, power plant on boats, etc

TYPE	AMPS	VOLTS	
New T1	25	12	\$13.95
Used but Guaranteed Condition			
G1	140	27	\$17.95
P1	200	27 1/2	\$22.50
R1	300	30	\$29.75
E5A	50	12	\$17.95

D. C. METERS

AMMETERS		VOLTMETERS	
-30 - 0 - 30+	0 - 240	0-30	\$3.95
-60 - 0 - 60+	0 - 300		
	0 - 350		\$3.95 ea.

All 2" face except 0-300 which is 3" face.

COMBINATION

VOLTMETER - AMMETER
 30V - 30 AMP **\$4.95**
 30V - 60 AMP

SHUNTS - Required for use with D.C. Ammeters 30-60-120-240-300-350.

SOLD ONLY WITH METERS. \$1.00



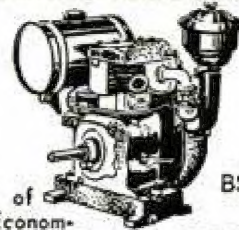
Palley POWER PARADE

NEW BRIGGS & STRATTON MOD. "A"

GAS ENGINE That nationally known "workhorse" of single cylinder engines! 2.10 HP-4 cycle, air cooled, Economical & Easy to Operate. Drives small pumps, boats & farm equipment. Brand New - Still in Original Crates. **BS-A \$62.95**

CONTINENTAL The famous 4 cycle, aircooled-"L" head gas engine, 1 1/2 to 2 HP. Cheap power for Farm, Factory, Shop--ONLY **\$47.95**

Ellinwood "44" A Real Buy!! 4.4 to 5 HP with optional power take-off from crankshaft, 1-1 speed from camshaft 2-1 reduction. Lightweight & of finest component parts-Bendix, Timken, Air Maze, etc. A Terrific Gas Engine Value . . . **\$69.95**



POWER UNIT PU-1

Complete Model GKB 12-24-100 consists of sgl. cyl., 4 cycle, air cooled Briggs-Stratton Gas Engine directly connected to 2800 watt generator. Engine is 6 HP governed between 2500-3200 RPM. Generator rated 28.5 V - 100 A. Unit mounted 4 rubber shock mts., channel iron base & wheels. Use as Lighting or Power Plant The Buy Of The Century **\$109.89**
 Good Cond. - Overhauled



10 H. P. CONTINENTAL GAS ENGINE

4 cylinder - Water cooled - Complete with Radiator, Tachometer, Magneto ignition & built-in gas tank - Mounted on heavy steel frame for portability - A very powerful, smooth running job. Used but in guaranteed condition. **\$175.00**

Electronic Transmission Gear Train

GT-1 Containing approx. 50 Bronze Spur & Pinion Gears ranging from 3/8" to 4" dia., 5 sets of 7 cluster gears, 2 complete worm & worm gear drive sets, 40 N.D. ball bearings from 1/2" to 1 1/2" dia. watch springs, bushings, posts, face plates, housings, Micro Switches, etc. All gears are in multiple size and sequence with identical teeth ratio giving hundreds of ideal gear reduction combinations. 19 lbs. of Pleasure and profit. A Tremendous Gadget Mine. ONLY **\$8.49**



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GEAR BOXES VTG-1 - 90°

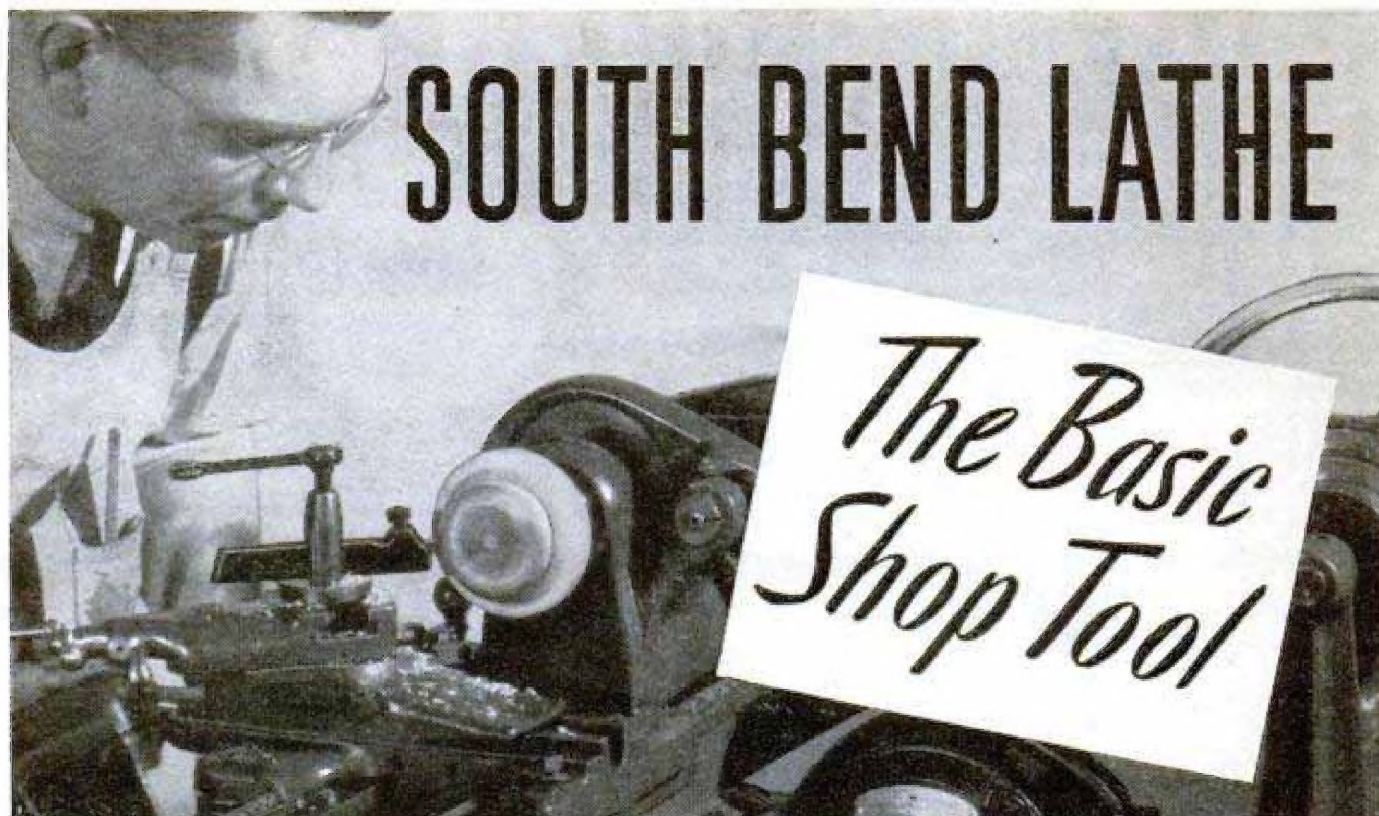
Bevel gear 1 1/2 to 1 reduction, size 7" x 6". A Life-time Value. **\$3.95**
 VTG-2 - Inline spur gear 16 to 1 reduction, thru 4 gears. Final take-off 4 1/2" dia, 26 tooth. 3/4" Alum. spur gear. . **\$6.49**

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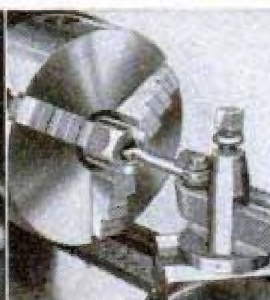
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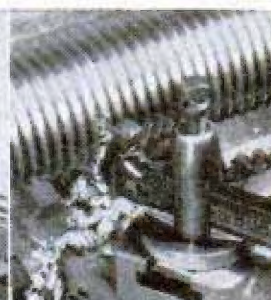
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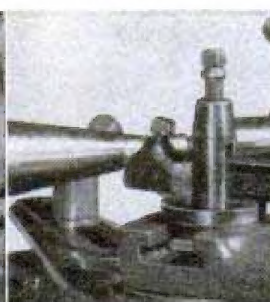
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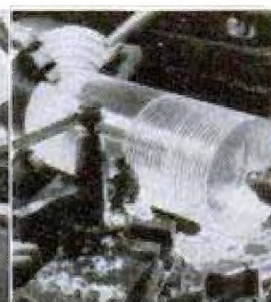
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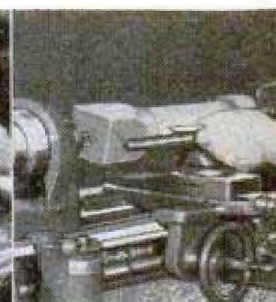
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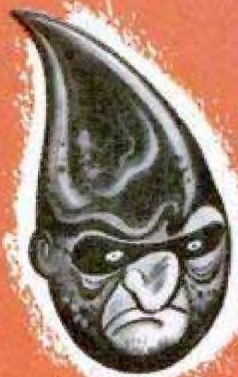
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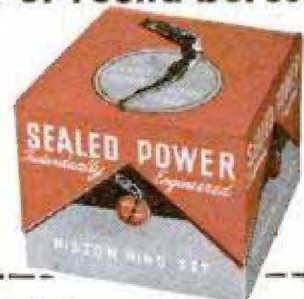
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